Insulin

Diabetes Care Coaching

OKAKI

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Before We Begin …

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- Our goal is to create a safe space where all participants are comfortable to learn, share, ask questions
  - Everyone brings knowledge and expertise
  - I am always learning too
  - We won't record discussions, but will share monthly education videos
- The coaching sessions will focus on practical pieces of working in diabetes. For details, it is always best to reference the Diabetes Canada Clinical Practice Guidelines (guidelines.diabetes.ca)

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What We Plan to Cover Today

- Injection technique
- Types of insulin
- Practicing calculations / insulin adjustments

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Injection Technique

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Injection Technique

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- Based on FIT guidelines
- Studies show high rates of lipohypertrophy
  - Estimated to affect up to 64% of people who take insulin at some point!

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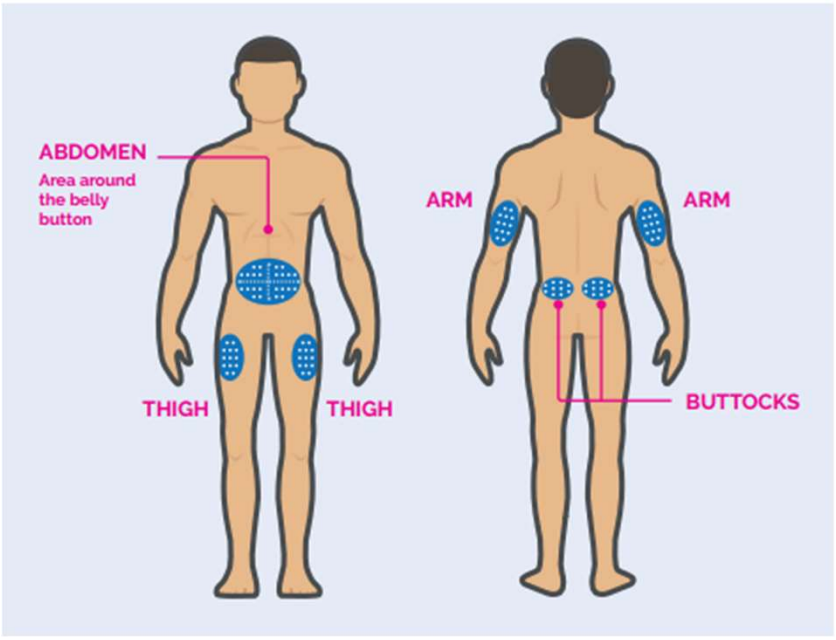

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Injection technique

- Clean hands, clean site
- New needle
- Select site
  - Abdomen most consistent absorption
  - Avoid scars, moles, stretch marks, etc
  - Rotating

www.diabetes.ca/resources/webinars/how-to-inject-insulin-a-step-by-step-guide

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Injection technique

- Prime insulin pen
- Insert at 90°
  - May need skin lift for extremely lean individual, or longer needle tip
- Inject + hold for 10 seconds

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Injection technique

- Ensure dose window back at 0
- Review site
  - Ensure no insulin on surface
  - Bleeding/bruising okay
- Proper sharps disposal
- Keep current insulin at room temperature

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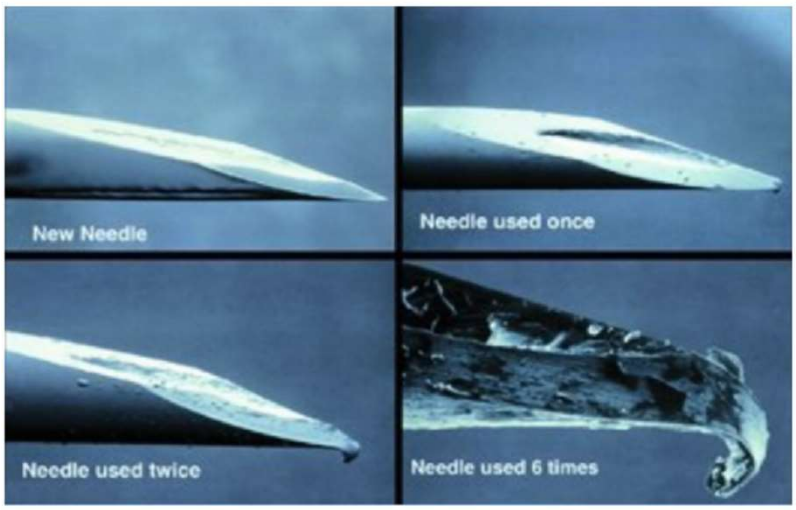

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What to review with patients?

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- Timing of insulin?
- How often remembering?
- Technique
  - Checking for lipohypertrophy?
  - Rotating sites?
  - Priming pen?
  - Counting to 10?
  - Comfort… new needle tip, type of needle tip, avoiding excessive force

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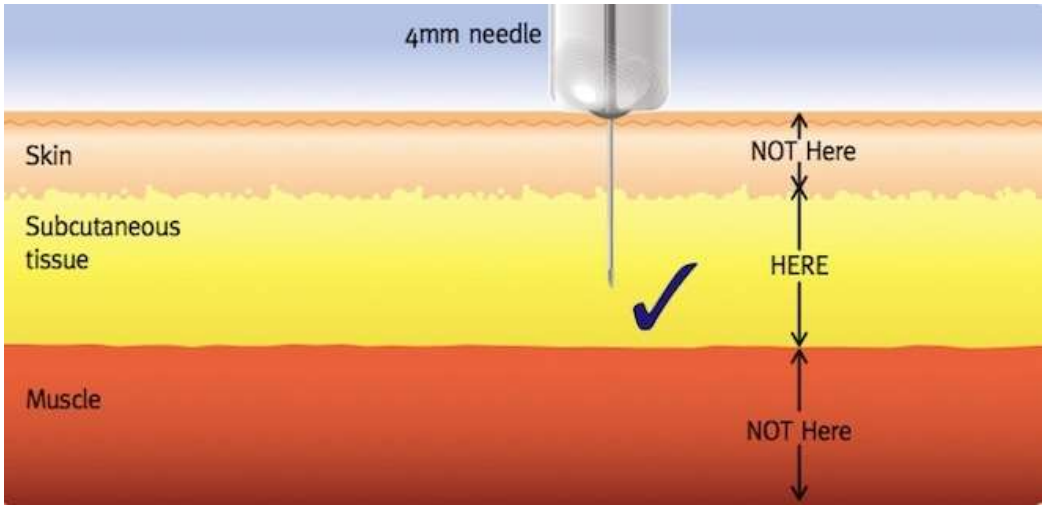

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Refresher on Types of Insulin

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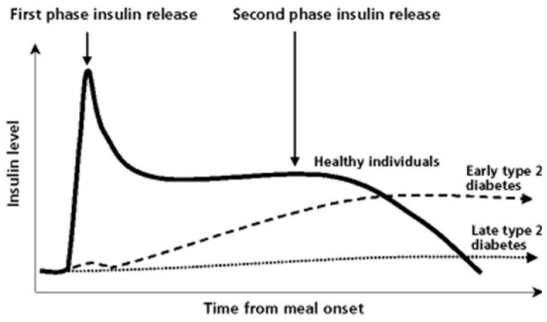
Insulin Release in the Body

Insulin naturally produced in a two phases following meals:

1. Small burst within 2-10 minutes of eating

2. Slow release over 2-3 hours following meal



Also produced 24 hours/day to match fluctuations in glucose

Image from Medclique.org

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Types of Insulin

Vary in time of onset, peak, and duration of action

- Rapid-acting
- Short-acting
- Intermediate
- Long acting
- Ultra long acting
- Mixed

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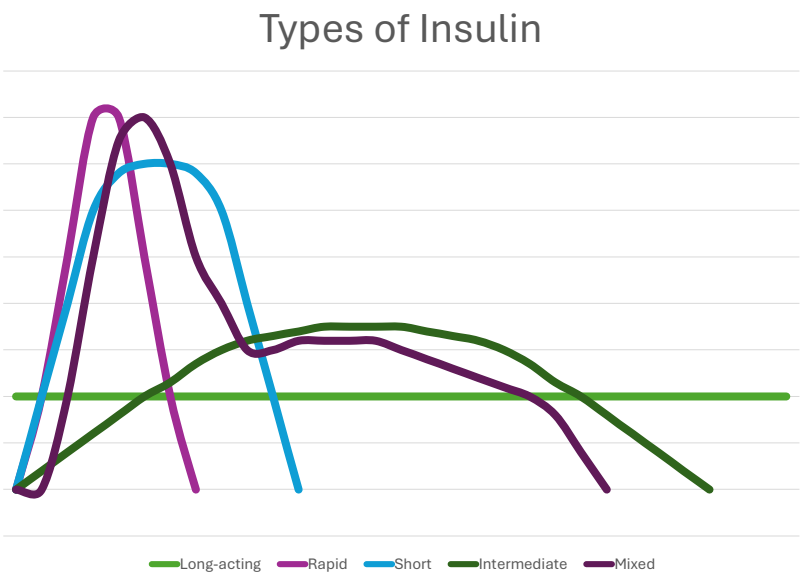

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Insulin – Long-acting

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- Taken once or twice a day
- Targets fasting
- Matching glucose released from liver

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Long-acting Insulin

- Lantus
- Basaglar
- Levemir
- Toujeo
- Tresiba

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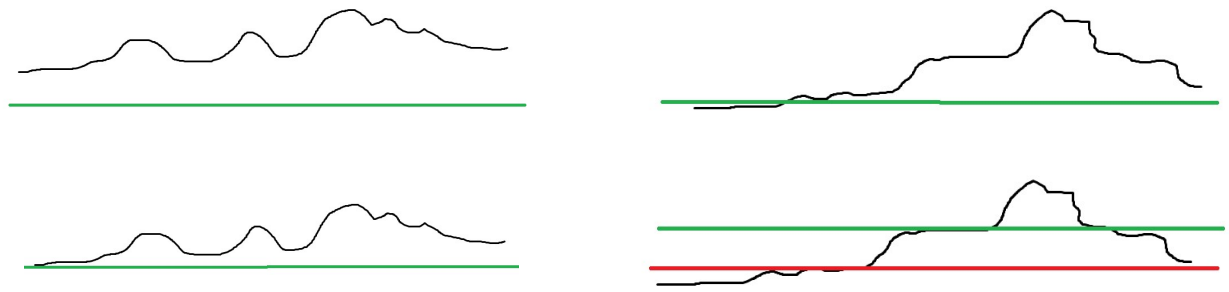
Long-acting Insulin



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Long-acting Insulin- Glargine, detemir, degludec

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	Onset	Peak	Duration (hours)
	90 min	N/A	Detemir 16-24 Glargine 24 U-300 >30 Degludec 42
Brands	Lantus, BasaGlar, Levemir, Toujeo, Tresiba		
	• Variable shelf stability (28-56 days) • Lower risk of hypoglycemia with degludec and glargine U-300 compared to glargine U-100 • Syringe, reusable pen, prefilled pen		

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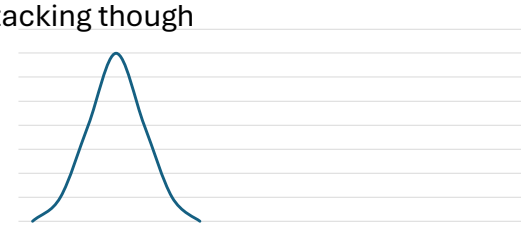
Insulin – Rapid-acting

- Taken with meals
- Matches sugars from food, can also be used for correction dosing
  - Careful of insulin stacking though



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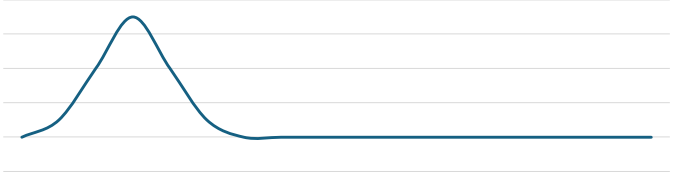
Rapid-acting Insulin- Aspart, Glulisine, Lispro

	Onset	Peak	Duration
	10-15 min	1.5-2 hours	3-5 hours
Brands	NovoRapid, Fiasp, Apidra, Humalog, Admelog, Trurapi, Kirsty		
	• Delivered via syringe, pre-filled pen, reusable pen, or insulin pump • Less hypoglycemia risk than short-acting insulin • Fiasp "NovoRapider": 4 min onset, 60-90 min peak • Clear		



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Rapid-acting Insulin

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- NovoRapid
- Fiasp
- Apidra
- Humalog
- Trurapi
- Admelog
- Kirsty

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Insulin - Mixed

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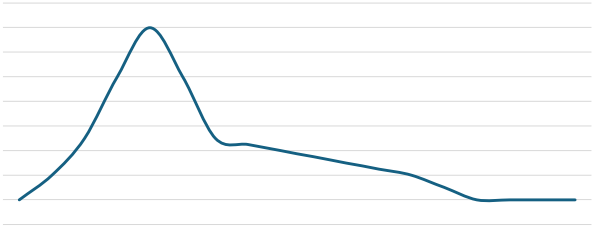
- Taken twice a day
- Two types of insulin mixed together



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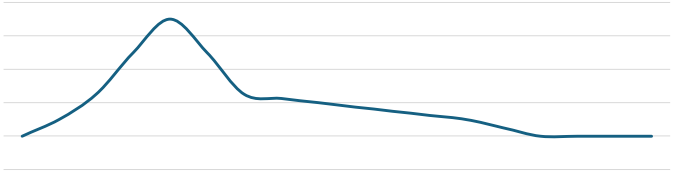
Mixed Insulin- Humulin, Novolin, NovoMix, Humalog Mix

	Onset	Peak	Duration
	Variable	Variable	Variable
Brands	Humulin, Novolin, NovoMix, Humalog Mix		
	• Regular insulin or insulin analogues combined with intermediate insulin • Variety of combinations available: 25/75, 30/70, 40/60, 50/50 • Cloudy		
			

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Premixed Insulin

- Humulin
- Novolin
- NovoMix
- Humalog Mix

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Insulin is not treatment failure!!!

In T2DM, important to discuss that pancreas does produce less insulin than someone without diabetes, therefore not uncommon to require insulin.

Diabetes is a chronic and progressive disease.

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Insulin Dosing & Adjustments

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Starting Doses - Basal

Basal – typical to start with 10 units*

Titration
- Most - 1 unit/day until FBG to target (4-7 mmol/L)
- Degludec (Tresiba) – 2 units q 3-4 days or 4 units/week

If changing from twice daily long acting to once daily, reduce total daily dose by 20%

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Starting Doses - Bolus

- Start at 2-4 units with largest meal
- Teach in context of carbohydrates
- Titration – decide based on 2 hours postprandial or pre next meal

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Starting Doses – Basal/Bolus

- 0.3-0.5 units/kg = total insulin dose
- 40% basal, 20% bolus with each meal
- Example: 80 kg
  - 0.3 units/kg x 80 kg = 24 units
  - Basal = 9.6 units Bolus = 14.4 units total
  - Bolus = 5 units/meal

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How to know if dose is correct?

- Basal
  - Add middle of the night monitoring if not on CGM
  - Glucose should hold stable within 1.7 mmol/L
  - Ex. Went to bed 6.5 mmol/L, fasting should be ~5.5-7.5 mmol/L
- Bolus
  - 2 hour post prandial rise < 3 mmol/L
  - 4 hour post prandial +/- 1 mmol/L pre-meal value
  - Example
    5.3 mmol/L before meal
    2hr 7.6 mmol/L
    4 hr 5.5 mmol/L

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Adjusting Doses

- Always address **hypoglycemia** first
- Next look for patterns
  - Diabetes Canada – should occur >2 times/week to be considered a pattern
  - Have a conversation with the patient to understand what contributed to lows/highs/more consistent days
- 10% adjustment is good rough guideline to keep in mind

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What needs adjusting?

If **BREAKFAST** glucose is:		If **LUNCH** glucose is:		If **SUPPER** glucose is:		If **BEDTIME** glucose is:		If **OVERNIGHT** glucose is:
LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
Bedtime Basal		Breakfast Bolus		Lunch Bolus		Supper Bolus		Bedtime basal or bedtime snack bolus

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Insulin Sensitivity Factor (ISF)

Can also be called a Correction Factor (CF)

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ISF Calculations

ISF = 100/ TDD

TDD = Rapid acting doses + long acting dose(s)

ISF tells us 1 unit of insulin lowers BG by X

- ISF of 1 means we estimate 1 unit of insulin lowers BG by 1
- ISF of 2 means 1 unit lowers by 2
- ISF of 0.5 means 1 unit lowers by 0.5, or 2 units lower by 1

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Reminder – ROUND UP

How much to round up? Depends on:

- Current glucose control
- Blood glucose targets
- Patient comfort

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ISF Practice

- Female in her 80s has been consistently taking:
  - Humalog 17 units before meals (three times/day)
  - Basaglar 20 units once daily (increased September 26)

So… TDD = 17x3 + 20 = 71
ISF = 100/TDD so 100/71 = 1.4
So this means we think 1 unit of Humalog will bring down her sugars by 1.4
… always better to be cautious when rounding, so go to 2 "1 unit drops by 2"

E.g. She is at 10… takes 1 unit of insulin… we estimate it drops to 8, instead of just to 9 … being more cautious to start

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Sliding Scale Calculations Practice

Blood Sugar (mmol/L)	Breakfast (units)	Supper (units)	Bedtime (units)
Less than 4	Treat low sugar with 15 grams of sugar		
4 – 10.0	BASE DOSES GO IN HERE		
	THEN THESE ARE TYIPICALLY GOING TO INCREASE BY 1 UNIT		

CAN HAVE DIFFERENT COLUMNS FOR TIMES OF DAY, AMOUNTS OF CARBS, SIZE OF MEAL, ETC… THIS IS VERY PATIENT SPECIFIC!

DECIDE ON TARGET RANGE

TYPICALLY, GO UP BY SAME INCREMENTS AS ISF …
EX. IF ISF IS 3, THEN NEXT WOULD BE 10.1-13.0
(BECAUSE WE EXPECT THE 1 UNIT INCREASE IN RAPID INSULIN TO DECREASE BG BY 3)

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Sliding Scale Calculations Practice

Try it for our patient!
We have base dose of 17 units, and ISF of 2

Sliding Scale for Humalog Mealtime Insulin:

Blood Sugar (mmol/L)	Smaller / Low Carb Meals (units)	Regular Size Meals (units)
Less than 4	Treat low sugar with 15 grams of sugar	
4.0 – 12.0	14	17
12.1 – 14.0	15	18
14.1 – 16.0	16	19
16.1 – 18.0	17	20
Above 18.1	18	21

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Sliding Scale Calculations Practice
ISF of 0.5

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Sliding Scale Calculations Practice
ISF of 0.5

Blood Sugar (mmol/L)	Breakfast (units)	Supper (units)	Bedtime (units)
Less than 4	Treat low sugar with 15 grams of sugar		
4 – 10.0	10		
10.1-12.0	14		
12.1-14.0	18		
14.1-16.0	22		
16.1-18.0	26		

ISF = 0.5
1 unit lowers BG by 0.5
So that also means - 2 units lowers BG by 1, or 4 units lowers BG by 2

I like to "test" it like this:

If this person's sugars were at 17, they would take 26 units of insulin (16 units extra)

We expect
1 unit lowers BG by 0.5,
16 units lowers by 8

17 – 8 = 9
So we'd get BG to target range of 4-10.

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Another Practice

- 51 year old female with T2D
- Tresiba units 200 units daily in AM – has really been working on consistency and is taking most days
- Humalog 35 units with meals:
  - was previously rarely taking anymore as eating low carb, increased PA
  - struggling to take Humalog regularly with meals, fearful of lows later
  - ++ stress currently and is off-routine, away from her house as caregiver at hospital and often forgetting to take insulin

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Another Practice

- Correction Factors help us "catch" high BG
- ISF = 200 + 35 Humalog x ??
  - 200 + 35 = 235 … ISF = 100/235 = 0.43
  - 200 + 70 = 270 … ISF = 100/270 = 0.37
  - No Humalog … ISF = 100/200 = 0.5
- We talked through ISF of 2 (or could start at 1 if that feels safer)
  - This means 1 unit of Humalog will lower sugars by 2
  - Examples when gets home and sees sugars are at 15, subtract from goal of sugars at 10, so 15 – 10 = 5. Then multiply by CF of 2 = 10. Take 10 units of Humalog as correction dose.

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