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## Type 2 Diabetes

- This is an amazing time in the history of management of diabetes. There are many new (oral) medications and technology to make this easier and get better outcomes.
- What do NORMAL sugars look like?

	Normal Glucose Tolerance
Fasting plasma glucose mg/dL(mmol/L) <sup>b</sup>	<100 (5.6)
2 h after glucose load mg/dL (mmol/L) <sup>c</sup>	<140 (7.8)
HbA <sub>1c</sub> (%) <sup>a</sup>	<5.7
Symptoms and random glucose level (mg/dL)	-

- Diabetes is an inherently progressive disease, so EARLY AGGRESSIVE interventions buy us more health and time in the future.
  - It's important that we are also just as aggressive with blood pressure, cholesterol and bone health because **these are all interrelated**
- This is about making systematic long term changes and aiming to hit your targets 80% of the time
  - Because of the advent of paleo, ketogenic and gluten free diets, there are a lot of food & cooking resources available and **LIFESTYLE IS THE CORNERSTONE OF YOUR SUCCESS.**
- This is NOT about eliminating anything from your life, just shifting perspective and adjusting your approaches.
- Fundamental principles of glucose control
  - **Always bring your meter to every doctor's appointment**
  - Avoid "naked" carbs; always pair with fat, fiber or protein to avoid spikes.
  - Reducing your baseline body weight by 5-10% will dramatically improve your insulin sensitivity -- **some people can resolve their diabetes!**

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- Moderate exercise can improve your insulin sensitivity for days. Use your Fitbit! Every time you choose the stairs, the bicycle or the gym this is money in your pocket.
  - Moderate = walk/jog 1 mile in 12-15 minutes, or equivalent
- Here are some items that can help prevent sugar spikes - check Target, Costco, Walmart and Amazon for best prices
  - Apps: Figwee, Loselt! or MyFitnessPal for calories, portions and carbs
  - Bread: Nature's Own Life Wheat + Protein or Wheat + Fiber
  - Cereal: The Cereal School; Magic Spoon, steel cut oatmeal
  - Frozen pizza:
  - Polaner or Welch's Fruit spreads without added sugar
  - Sweeteners: monkfruit extract, agave syrup, stevia or Swerve (erythritol)
  - Nuts and nut butters (without added sugars)
  - Protein bars: Pure Protein, Power Crunch, One protein bars
  - Protein shakes: Premier Protein, Pure Protein, Fair Life Core Power, Cornerstone
  - Low carb/high fiber pasta: Shirataki "miracle" noodles, Weight Watchers Skinny Pasta, edamame pasta, Hearts of Palm
  - Chobani Greek, Dannon Light & Fit Greek or Sigge's Skyr yogurt
  - Frozen meals: Gabriella's Kitchen Skinny Pasta/Frozen meals; RealGood enchiladas; Quest, RealGood frozen pizzas
  - [soft] cheeses, lean meats, fish
  - Strawberries, blueberries, raspberries, blackberries
  - Bob's Red Mill low carb baking mix
  - Kodiak Power Cakes pancake/baking mix
- **How to RESCUE a sugar < 70**
  - Glucose tablets are available over the counter and a bottle of 50 tablets costs about \$7.
  - Eat 16-20g glucose, **wait 15 minutes** and recheck sugar
    - 4-5 glucose tablets OR,
    - 6-7 oz apple or orange juice OR,
    - 4-5 packets of sugar in water
  - If sugar is still < 100, repeat step 1 until sugar > 100
  - Once sugar > 100, eat a small mixed snack (protein, fat, carb) to maintain your glucose in the normal range.
  - **Avoid overtreatment** -- we don't want to have a glucose of 300 afterward, because chasing high blood sugar is a losing game.
  - Think about what caused your low: did you miss a meal? Exercise? Miscalculate how much insulin you needed? We need to find and correct the cause.

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- **NOTE:** chocolate is not a good rescue because it has a lot of fat in it. You won't get a quick improvement.
- How do I adjust my insulin?
  - Basal (Lantus, glargine, Levemir, detemir, Tujeo, degludec, Tresiba, etc.)
    - For you, a fasting AM sugar of \_\_\_\_\_ is PERFECTION
    - Choose **2 days of the week that are not next to one another**, i.e., Monday & Thursday
    - These are the days of the week where you will adjust your basal insulin doses, according to your fasting sugar.
    - If your fasting AM sugar is > \_\_\_\_ you will ADD more basal insulin that day
      - Similarly if your fasting AM sugar is < \_\_\_\_, you will REDUCE insulin dose
    - Keep doing this on the Mondays and Thursdays until you achieve your goal range.
  - Mealtime (Humalog, Novolog, lispro, Apidra, aspart, etc.)
    - For you, the 2 hour post-meal sugar of < \_\_\_\_\_ is PERFECTION.
    - Because mealtime insulin is so rapid-acting, you can make changes to your dose on consecutive days.
    - If your 2 hour post-meal sugar is > \_\_\_\_ you will ADD another 1-2 units of insulin. If your 2 hour post-meal sugar is < \_\_\_\_ consider REDUCING the dose.
- **What if I RUN OUT OR LOSE my insulin?**
  - First call your pharmacy to see if you have refills.
  - If you don't have refills, call the office to get one.
  - If you can't reach anyone to refill your insulin, here's what to do:
    - Go to any pharmacy and tell the pharmacist that you are diabetic and you have run out of insulin. Walmart will have the best price (about \$25)
    - Ask them to give you **NPH insulin** and the needles/syringes over the counter. **You DO NOT NEED A PRESCRIPTION IN TEXAS.**
    - Give yourself \_\_\_\_\_ units of NPH insulin every 12 hours -- **this will keep you OUT of DKA and the hospital** until you can get a refill of your usual insulin (it's OK if your sugar isn't perfectly controlled, it's just a temporary "band-aid").
- Family planning (women only)
  - About half of all pregnancies in the United States are UNPLANNED.
  - There are significant risks to both mother and baby when an unplanned pregnancy occurs in diabetes, so **it is fundamental for mom's & baby's safety to plan for conception appropriately.**

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- If you are NOT ready for pregnancy there are many options for reliable contraception: intrauterine devices, progesterone implants, contraceptive pills/injections, contraceptive rings or permanent sterilization depending on your needs and preferences.
- What can I do to make my life easier/get better control?
  - #1: Always take your medications as prescribed and do not miss doses.
  - #2: Always bring your glucometer or a glucose log to your appointment.
  - #3: use a sensor if it's appropriate
    - **Dexcom, Guardian, Libre, Eversense are all options**
- Resources to utilize when you have questions or want to learn more:
  - YMCA Diabetes Prevention Program  
<https://amaymca.org/programs/health-wellness/diabetes-prevention/>
  - American Diabetes Association [www.diabetes.org](http://www.diabetes.org)
  - Centers for Disease Control <https://www.cdc.gov/diabetes/ndep/index.html>
  - National Institutes of Health  
<https://www.niddk.nih.gov/health-information/diabetes>
  - Mayo Clinic [www.mayoclinic.org/diseases-conditions](http://www.mayoclinic.org/diseases-conditions)

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## Heart Health & Cholesterol

- What's my risk?
  - **Diagnosis of Type 2 Diabetes is an automatic "high risk" category!**
  - **Previous heart attack, stent, bypass, stroke or other artery blockage**
  - Family history of heart attack, stent, bypass or stroke (especially if under age 55 men, or age 65 in women)
  - High cholesterol: LDL > 190, Lp(a) > 30, or ApoB > 90
  - Sedentary lifestyle (< 7,000 steps/day)
  - A diagnosis of high blood pressure, diabetes, rheumatologic conditions, cancer, HIV or chronic kidney disease
  - Current tobacco use
  - Diagnosis of sleep apnea or neck circumference larger than 16" women, 17" men
  - Waist circumference larger than 35" women, 40" men or Metabolic Syndrome
  - Low good cholesterol HDL < 40
  - High triglycerides > 150
  - Regularly consume a diet heavy in animal products or saturated fats (solid at room temperature)
  - Previous radiation to the chest
- FACTS about Heart Disease
  - **Heart disease kills more people in the United States than ALL CANCERS COMBINED.**
  - There is > 1 death by heart attack every 36 sec in the US. > 800,000 per year!
  - 50% of people who have a heart attack will not survive long enough to get to an ER
  - **After getting to an ER**, modern cardiology is very good at prolonging life with varying degrees of preserving the function of the heart.
  - We are ALL born with atherosclerosis -- it starts while we are a fetus!
  - **Heart disease is PREVENTABLE and fully TREATABLE: No one should be having a heart attack in this country.**
  - The Vegan and Mediterranean diets are the only diets known to reduce mortality from cardiac causes.
  - The entire process of plaque formation is mediated by inflammation.
  - We can SEE some plaques on radiologic images, mostly in the aorta because it is so large.
    - If you have a plaque in 1 spot, you are guaranteed to have plaques in MANY spots.
  - The #1 & #2 risks for heart disease are AGE and being MALE
- FICTIONS about Heart Disease

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- “I’m too young to worry about heart disease”
  - We develop early plaques **in the womb**
- “My cholesterol has never been high (>100) so I don’t have to worry”
  - The average LDL (bad cholesterol) of a patient **having a heart attack** in this country is **90**
- “My good cholesterol (HDL) is so high that it makes up for my bad cholesterol (LDL)”
  - HDL is a good “pipe cleaner” but only if the molecule is appropriately working.
  - So far we have no way of measuring the functionality of HDL, so we cannot count on it to save us when LDL is high.
- “Statins cause diabetes”
  - Statins have been found to accelerate the onset of diabetes in patients who are already pre-diabetic. The difference is about 2 years.
- “Statins cause dementia”
  - This was disproven in 2013 by Johns Hopkins with a large review of many studies that examined over 23,000 patients
  - Statins are potent anti-inflammatory agents that will protect the vasculature in the long term and reduce the risk of dementia caused by vascular events.
- “I can’t tolerate taking statins, they cause muscle pain”
  - The blinded randomized placebo-controlled trials show no difference in the onset of muscle pain regardless of whether the person was taking the actual statin or a placebo.
  - Even a small dose of a potent statin a few times a week can have an important impact on disease prevention.
- “I am a very heavy exerciser (marathons, etc.) so my heart is fine”
  - Even people who look amazingly healthy and fit can have heart disease, probably due to a hereditary disorder of cholesterol metabolism.  
**Everyone needs to be screened!**
- “Heart disease is genetic, so there’s nothing I can do”
  - We have many tools, medications and technology to identify early heart disease and REGRESS atherosclerosis, including
    - Statin medications - Lipitor, atorvastatin, Crestor, rosuvastatin, etc.
    - Medication called Zetia (ezetimibe)
    - Medications called PCSK9 inhibitors (Repatha)
    - Lifestyle/dietary guidelines - there is substantial data showing that plant-based and Mediterranean diets reduce death by cardiovascular causes.

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- Coronary artery calcium (CAC) scores
- Blood tests for cholesterol, inflammation & genetic disorders of metabolism
- What's a Coronary Artery Calcium Score?
  - This is a non-invasive CAT scan of the heart. NO dye/contrast is used. The radiation exposure is equal to that of a mammogram, or living at 5000' elevation for 3 months.
  - The image is synced to an EKG
  - Takes about 10 minutes, costs anywhere from \$50-\$150 depending on where you have it done.
    - Some insurances cover it, but this depends on your state and the payor.
  - The radiologist and the computer calculate a standardized score of plaque formation in the tiny coronary vessels of your heart.
  - Long term data shows us that when the CAC score is 0, the odds of a cardiac event are  $\leq 1\%$  in the next 5 years.
  - **Any** CAC score  $> 0$ , regardless of age, correlates with significantly higher odds of cardiac events over the next 10-15 years.
    - The higher the score, the higher the odds of an event.
    - Scores  $> 100$  are most severe -- we need to be aggressive with treatment
    - Medical therapy is VERY effective at minimizing bad cholesterol and reducing heart related mortality.
  - What if my score is 0?
    - Your risk of an event in the next 5 years is minimal! But we should check again in 5 years, because AGE is the #1 factor in heart disease.
  - What if my score is small, like 1-10?
    - **Any score  $> 0$  matters** but when the score is  $< 10$  it is very reasonable to optimize lifestyle and diet and retest in 5 years.
- Resources
  - National Heart Lung & Blood Institute <https://www.nhlbi.nih.gov/health-topics/heart-attack>
  - Mayo Clinic [www.mayoclinic.com](http://www.mayoclinic.com)
  - Centers for Disease Control <https://www.cdc.gov/heartdisease/index.htm>

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## Bone Health, Osteopenia & Osteoporosis

- **Bones are very much alive and are constantly remodeling** in response to the forces that are applied to them
  - Think of bone remodeling like repaving a road:
    - Cells go along and chew up the “old asphalt” (bone matrix)
    - Other cells follow behind them and lay down the “new asphalt”
    - As we age, the cells that lay down new bone slow down more than the ones that break down the old bone. This eventually leads to osteoporosis.
  - Remodeling is affected by other diseases, like diabetes, COPD or rheumatoid arthritis, and also by medications like steroids, chemotherapy or drugs that are used to block testosterone as part of prostate cancer treatments.
  - **Smoking and alcohol consumption are also major inhibitors of bone metabolism!** Stop smoking and limit alcohol to 2 drinks/day or less.
- **How do I know if I’m at risk for problems with my bones?**
  - If the women in your family have had osteoporosis or broken hips
  - If you smoke, drink alcohol or have any inflammatory diseases like rheumatoid arthritis, ulcerative colitis, lupus, crohn’s disease, COPD, diabetes, or obesity.
  - If you have had problems with low vitamin D.
  - If you have lost height, changing posture or have nagging pain in your back.
  - If you have had certain types of non-traumatic fractures in the past.
  - If you have had to take steroids (prednisone) in high doses or for long periods of time.
  - If you had an early menopause or have a condition resulting in low testosterone.
  - If you have been critically ill and/or bedridden.
- How do we find bone disorders?
  - The standard imaging is by a DEXA scan, which is like an X-ray but takes longer. We use a facility that also assesses the Trabecular Bone Score, or micro-architecture of the spine, as this can be a deciding factor about who needs treatment.
    - The scan produces a T-score reading, which compares your bone density to a young normal bone density.
    - A T-score between -1 to -2.5 is osteopenia, or early thinning.
    - A T-score worse than -2.5 is osteoporosis.
    - For young people, a Z-score worse than -2.0 is highly suggestive of osteoporosis.
  - Any non-traumatic fractures of the spine, low impact fractures of the hip/femur or a fracture around a new prosthetic implant also counts as osteoporosis.
- How do we treat disorders of bone metabolism?

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- We always need to check to see if there are underlying causes for bone disorders and treat that (i.e., hyperthyroidism, lymphoma, multiple myeloma, overactive parathyroids, etc.)
- Everyone should have adequate calcium and vitamin D in their diet or supplement, so the body has the right building blocks for healthy bone formation.
- Because bones remodel in proportion to stress that's applied to them, we recommend daily weight bearing exercise like you would do anyway for heart health.
- We must avoid muscle wasting, or sarcopenia, and so diet should aim for protein intake of approximately 1.3g/kg daily.
- We treat osteoporosis with drugs like Fosamax or Boniva. Their job is to slow down those cells that break down the old bone, so the "new asphalt-laying" cells can catch up. It takes months to years to see the effect.
- There is another drug, Forteo, which boosts the activity of the cells that lay down new bone, and works to heal fractures quickly.
- How much calcium and vitamin D do I need?
  - That depends on your age and your general bone health.
  - We want to maintain a blood vitamin D level between 20-50.
  - Getting calcium from the diet is best, but supplement if needed.
    - The average American diet contains 600mg of calcium daily, and each serving of dairy confers about another 300mg.
    - There are many non-dairy sources of calcium as well (See Lists)

**Table 13**  
**Recommended Dietary Allowance for Calcium**

Age	Sex	Recommended dietary allowance (mg/d)
0-6 mo	M + F	200
6-12 mo	M + F	260
1-3 y	M + F	700
4-8 y	M + F	1,000
9-18 y	M + F	1,300
19-50 y	M + F	1,000
51-70 y	M	1,000
51-70 y	F	1,200
71+ y	M + F	1,200

From Ross et al (77 [EL 4; consensus NE]). Reproduced with permission.

Calcium Carbonate  
400-600mg/d  
Absorbs better with vitamin D  
& when taken with meals

Goal Vitamin D Level

- How does obesity affect bones?

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- If you have a pair of identical twins, who both weigh 300 lbs, but one is a bodybuilder and one works at a desk all day. The body builder would have better bone density and health:
  - This is because his muscles are constantly pulling on his bones, applying stress, and the bones remodel in response.
  - The other twin has a lot of weight on his bones, but less traction. This combined with the inflammatory state of obesity actually **BLOCKS** bone remodeling!
- What medications are available?
  - Antiresorptives: Slow the breakdown of the old bone, so the new bone formation can catch up.
    - Fosamax (alendronate), Boniva (risedronate), Prolia (denosumab), Zometa (zoledronic acid), etc.
  - Anabolics: Work like a BIG boost to the cells that lay down new bone.
    - Forteo (Teriparatide), Tymlos (Abaloparatide)
  - Sclerostin inhibitors: works mostly to boost the cells that lay down new bone, but also slows the breakdown of old bone
    - Evenity (Romosozumab)
- What risks are associated with treatment?
  - Fosamax, Boniva, Prolia - these drugs are most famously associated with **osteonecrosis of the jaw**. This is **rare (1 in 40,000) at osteoporosis doses**, and **typically is only seen in the higher doses of drug that are used in cancer patients**. We screen everyone for risks (i.e., oral surgery, tooth extractions), and **I have only VERY rarely seen this complication**. However, if you **DO** develop this complication, it usually can be managed with mouthwash, antibiotics and conservative management by an oral surgeon.
    - The second famous risk with antiresorptives are called “**atypical femur fractures**” and are more likely to occur **when a patient has taken the drug for more than 5 years (1 in 20,000)**. Symptoms such as nagging pain in the groin/upper thigh are hallmarks of these fractures. We minimize risk of these fractures by re-evaluating the risks/benefits/alternatives to treatment when you approach year 5 of treatment.
  - Anabolic agents - these are powerful drugs and are highly effective, but if you have had radiation therapy to the spine, or when a patient is at risk for metastatic cancer, the risk outweighs the benefit of using these drugs.
    - The second problem with using these drugs is that once you finish the course of treatment, you **MUST follow it** by taking an

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antiresorptive agent, or else we will LOSE the bone we built over the last 2 years.

- Sclerostin inhibitor - it is not good for people who have had heart attacks or strokes in the last year. Treatment is typically for 1 year and MUST be followed with antiresorptive medication.
- Resources
  - National Osteoporosis Foundation <https://www.nof.org/patients/>

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**Livongo.com** can help you get a glucometer. Also check with the **drug manufacturer** and <http://prescriptionhelp.ace.com/> for assistance programs/coupons.

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# My device isn't working?! What should I do?

## Customer Support Numbers:

- Dexcom 844-607-8398
- Libre 855-632-8658
- Pogo 855-464-7646
- Vgo 866-881-1209
- CeQur 888-552-3787
- Omnipod 800-591-3455 option 4
- Tandem 877-801-6901
- Medtronic 800-646-4633 option 1
- Beta Bionics 855-745-3800

1. Call tech support/ trainer
2. Call clinic/ after hours line
  - a. If Dexcom/ Libre is not working **DO NOT CALL AFTER-HOURS NUMBER**
    - i. Use backup fingersticks until normal clinic hours
  - b. **If insulin pump is not working CALL AFTER-HOURS NUMBER**
    - i. If going to ER make sure to take your pump letter with you.
    - ii. If your pump is not working you will need to use your backup insulin pens!



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## Glucose Log

Date	Fasting	Mealtime	2h after meal	Bedtime	Notes (diet, lows, etc.)
1st					
2nd					
3rd					
4th					
5th					
6th					
7th					
8th					
9th					
10th					
11th					
13th					
14th					
15th					
16th					
17th					
18th					
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21st					
22nd					
23rd					
24th					
25th					
26th					
27th					
28th					
29th					
30th					
31st					

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