Type 1 Diabetes

- **Type 1 diabetes is an autoimmune disease**--your body has destroyed its own insulin producing cells (islet or beta cells). You are no longer able to produce insulin in quantities sufficient to "feed" your body. It can happen at any age, although classically it occurs in children.
- How is DM1 diagnosed?
    - The classic scenario is someone becomes critically ill with a condition called diabetic ketoacidosis, or DKA, because of their inability to make insulin. They go to the hospital, and improve once fluids and insulin are given.
    - Antibodies help us decide if someone is Type 1: GAD, IA-2, islet cell antibodies and zinc transporter antibodies.
    - A low or undetectable C-peptide when glucose is high also proves that the pancreas is unable to make insulin.
- How is DM1 treated?
    - All DM1 patients need insulin. Drugs like Metformin, Januvia or Victoza will not work for them. Patients do very well with insulin pumps that are linked to continuous glucose monitors (CGMs).
    - There is new technology available among insulin pumps that functions quite a bit like an artificial pancreas.
    - There are early studies underway for islet cells implants encapsulated in nanoparticles that keep the antibodies OUT while permitting insulin secretion--a cure may be on the horizon.
- What kinds of insulin are used?
        - Long acting, or basal insulin (glargine, Lantus, Basaglar, Tresiba, Toujeo, etc.): This is administered once, or sometimes twice daily. It mimics the "background" insulin secretion from your pancreas.
    - Short acting, or mealtime insulin (lispro, aspart, Humalog, Novolog, etc.):
        - this is administered before meals and when "correction" is required for sugars that are too high.
        - You can learn to count your carbohydrates to administer the precise amount of insulin you need for a meal. This gives you maximum flexibility in your lifestyle.
- How do I adjust my insulin?
    - Basal (Lantus, glargine, Levemir, detemir, Tujeo, degludec, Tresiba, etc.)
        - For you, a fasting AM sugar _____ 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

        - If your fasting AM sugar is > _____ you will ADD more basal insulin to the next dose
            - Similarly if your fasting AM sugar is < _____, you will REDUCE the next basal 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 any day.
        - If your 2 hour post-meal sugar is > _____ you will ADD insulin to your next mealtime dose. If your 2 hour post-meal sugar is < 100 consider REDUCING the dose.
- How to RESCUE a sugar < 70
    - Glucose tablets are available over the counter and a bottle of 50 tabs costs about $7
    - Eat 16-20g glucose, **wait 15 minutes** and recheck sugar
        - 4-5 glucose tablets OR,
        - 6-7 oz juice or cola OR,
        - 2-4 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!
    - 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.
    - **NOTE:** chocolate is not a good rescue option because it has a lot of fat in it. You won't get a quick improvement.
- **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 Walmart and tell the pharmacist that you are diabetic and you have run out of insulin.
        - 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 ER** 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 stopgap.

- 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 to everyone's safety to plan for conception appropriately.**
    - 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.
- How to make your life easier
    - Using a continuous glucose monitor (Dexcom, Medtronic, Libre or Eversense) can reduce the burden of finger sticks, and provide real-time readings of blood sugar.

- Resources to utilize when you have questions or want to learn more:
    - American Diabetes Association 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

Heart Health & Cholesterol

- What's my risk?
  - Current diagnosis of Diabetes (although Type I may be less risky than Type 2)
  - **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 cholesterols: 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 seconds 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

- "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.
    - 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 ≤ 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
    - Centers for Disease Control https://www.cdc.gov/heartdisease/index.htm

Having trouble paying for medications? Try **GoodRx.com** for discounts or we can help you enroll at **universaldrugstore.com** to obtain certain medications from Canada. **Livongo.com** can help you get a glucometer. Also check with the **drug manufacturer** and **http://prescriptionhelp.aace.com/** for assistance programs/coupons.

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?

- 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?

    - 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 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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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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29th					
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31st					