A LITTLE MORE INFORMATION

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This book is dedicated to everyone who helped me get to where I am today.

Special thanks to my father George, my mother Ruby, my brother Terry, and my sister Talia for their endless support.

Additional thanks to Maggie Roby helping me write this book.

Preface

Hi, I'm Dr. Zheng! I earned my MD from Northeast Ohio Medical University in Rootstown, Ohio.

A digital copy of this book is available for free at drandrewzheng.com. I'll also try to keep the paperback version of this book as cheap as possible.

Before I had any plans to write a book, I was putting together educational material during my final year of training at Cleveland Clinic Akron General. This was something I did to teach myself and teach others, but it wasn't until my first year in independent practice that I considered putting my notes into a book.

One goal of this book is to help improve the health of as many people as I can. I picked some of my favorite topics, which are centered around common chronic medical conditions related to heart disease (the leading cause of death in the United States).

Another goal of this book is to help my patients understand my approach to medicine better, which hopefully lets us have more meaningful conversations when they're in my office. You can think of this book as a "visit extender" — there are things in this book that I don't always have time to tell you during a 15- or 30-

minute visit.

I try to use the most up-to-date information, but since new research is always being done, I'll have to update my book from time to time. If you're interested in reading about any updates or errors in this book, visit my website at drandrewzheng.com. Additionally, you can email me at drandrewzheng@gmail.com. I'll try to be as correct as possible, but I'm not perfect!

This book does NOT contain individualized advice. **Every person is different, so please check with your medical provider before acting on what you read here.**

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Introductions

CHAPTER ONE

Dr. Who?

It's not easy for doctors and patients to get to know each other, so I'd like to share a bit about myself.

I was born in Texas in 1993. My parents emigrated from China and both earned degrees in chemical engineering. We moved to a quiet suburb near Cleveland, Ohio, when I was about 6 years old.

When I was 8 years old, my brother and sister were born. I give them five stars and two thumbs up! They contributed a lot to my love of pediatric medicine.

During middle school, I became fascinated with the field of psychology. I wanted to become a psychotherapist to help people with their mental health. Becoming a physician also seemed like a good way to help people. I did well in high school and got accepted into an accelerated undergraduate program at Kent State University. This two-year program was run by Northeast Ohio Medical University, which accepted you into their medical school if you completed their undergraduate program. My undergraduate experience was brief, but I enjoyed my time there.

Medical school came next. It was exciting to be surrounded by so many high-achieving people! It was also a challenging

experience; there were many days where I doubted if I'd ever become a good doctor.

I had to decide on what type of doctor I wanted to be after graduation. It was a tough choice; there are over 40 specialties to choose from! I discovered a few things about myself during medical school, which helped narrow down my options:

1. I liked working with kids.
2. I liked working with adults.
3. I liked working with mental health issues.
4. I liked developing long-term relationships with patients.
5. I didn't enjoy being in an operating room.

Specializing in family medicine ended up checking all the right boxes, so I started an internship at the Cleveland Clinic Akron General family medicine residency program in Akron, Ohio. Residency training is generally tough, but I mostly enjoyed my three years there. I learned a lot from my mentors, who shaped the way I practice medicine today.

During my final year of residency, I started my job search. Columbus was high on my list of places to move to because it kept me close to home and was a change in pace from being in Northeast Ohio for so long. After considering different job offers, I accepted a job with OhioHealth in August 2021.

…And here we are! I hope to learn more about you too!

Finally, it's pronounced *ZUNG*, but *ZANG* has grown on me over the years.

CHAPTER TWO

Philosophy

My goal is to help you live a healthy and happy life. There are MANY ways to do this. I'm a big proponent of avoiding medications if possible, but they're very helpful when lifestyle changes don't prove to be enough. I also don't see taking medications as a failure or something to be ashamed of. There's something to be said about making life "simpler" by taking medications. For example, if you have high blood pressure, there are MANY lifestyle changes you can make to reduce your blood pressure (e.g., reducing sodium and caffeine intake). Making these changes would be great, but for some people, it's easier to just take medication. Medication can also be a short-term solution while you work on lifestyle changes.

I often tell patients about the different ways they can fix their problems. Since every patient approaches health problems differently, I like to hear what YOU think the most reasonable option is. However, some patients hear me explain everything, and they say, "YOU'RE the doctor, so tell me what I should do!" Fair enough!

My approach to care is primarily based on evidence from trusted sources, while making some exceptions based on my personal experience and what you're able to do.

Unfortunately, you and I might not agree on everything! I'm not always correct, but I try to avoid doing anything that will cause more harm than good. If we aren't seeing eye-to-eye, I hope that we at least do our best to understand each other.

OK, let's dive into some health discussion!

Part Two

Health Maintenance

CHAPTER THREE

Primary Care Principles

Primary care providers (me!) are big on preventative health care. I've heard "The River Story" a few times during my training. It goes something like this…

A man was fishing in a river. Suddenly, he noticed someone coming down the river and sinking under the water. He pulled them out to safety, but he noticed several more people drowning.

After saving as many people as he could, he walked upstream to see where these people were coming from. He discovered a broken bridge that was causing people to fall into the river. He decided to warn people about the bridge and fix it so that more people wouldn't fall in.

Going upstream to find the root of the problem is a fundamental concept in preventative health care. Traditionally, health care experts are taught that there are many levels of prevention, but as medical science becomes more advanced, the differences between the levels get blurred and complicated. I think it's easier to think of prevention in just TWO levels:

1. At the early level, we try to prevent health problems from starting. Examples include giving vaccines, ordering mammograms, and exercising.

2. At the later level, we try to prevent EXISTING health problems from getting worse. Examples include starting diabetes medication and doing physical therapy after an injury.

It would be great if we could prevent everything at the early level, but this may never be possible because **we need to balance the harms of undertesting, overtesting, undertreating, and overtreating.** A good example of this balancing act is checking for colon cancer. We don't usually start screening for colon cancer (with colonoscopies, stool tests, etc.) in people younger than 45 years old, since the rate of colon cancer in younger people is incredibly low, so we'd be making many people go through unnecessary testing.

Additionally, some tests may be very expensive. Unfortunately, a lot of what happens in medicine is determined by money and insurance policies, but everyone at my office will try to make things easier for you.

Some tests may also involve radiation. Radiation damage can lead to cancer. You can see how counterproductive it'd be if we gave someone radiation-induced cancer by doing too many scans to check for problems! The younger you are, the more dangerous radiation is. Generally, you don't want to be exposed to more than 100 mSv of radiation in your life, but that's only a rough estimate. Some tests involve very low amounts of radiation, like chest x-rays (0.1 mSv). Compare this to a CT scan of the abdomen and pelvis (10 mSv).

(WARNING: LOTS OF STATISTICAL CONCEPTS IN THE NEXT FOUR PARAGRAPHS.)

Since preventative tests are used to try to find problems in patients, **we have to consider how accurate our tests are**. Tests have different degrees of sensitivity and specificity. If a test is 100% sensitive, it means that it will NEVER miss a diagnosis. If a test is 100% specific, it means that it will never misdiagnose someone with something they actually don't have. The perfect test would be 100% sensitive and 100% specific, but no test is perfect.

For example, a gonorrhea nucleic acid test is 98% sensitive and 96% specific, meaning that it will miss about 2% of cases (i.e. give us a false-negative result) and incorrectly say that someone has gonorrhea (i.e. give us a false-positive result) in 4% of cases, so it's a pretty good test, but not perfect.

For a more complicated example, let's look at the prostate antigen (PSA) test. This is a blood test that we sometimes use to check for prostate cancer. The test doesn't tell us "positive cancer" or "negative cancer" — it only gives us a level from 0 to over 10.0 ng/dL. A man's PSA levels generally go up with prostate cancer, but the levels also go up as men get older. For example, a 45-year-old without prostate cancer may have a PSA as high as 2.5 ng/dL. Thus, we have to decide what PSA level should be concerning. **The higher the level we choose, the more sensitive our test becomes, but the less specific it becomes.** We usually say that anything above 4.0 ng/dL is concerning enough to refer the person to a urologist for possible prostate biopsies and additional testing. This cutoff of 4.0 ng/dL is 21% sensitive and 92% specific, so it tends to miss prostate cancer, but it's fairly good at avoiding false positives. If we decided to use 1.0 ng/dL as the cutoff, then the PSA test would have a better sensitivity of 83% (i.e. catching more cancers), but have a worse specificity (i.e. we'd be referring

a lot of cancer-free patients to urologists for more testing).

In reality, test accuracy is a bit more complex than what I've explained so far. For example, a positive COVID test in a person **without any symptoms** is more likely to be a false-positive result than a true-positive result. This concept is related to a test's positive predictive value (PPV) and negative predictive value (NPV). I won't spend more time explaining statistical concepts in my book, but you can read more about them online!

The goal of preventative medicine is to keep you healthy for as long as possible, while also allowing you to enjoy your life. Let me tell you an amusing (and true!) story.

The Public Finance Balance of Smoking in the Czech Republic was a report by the tobacco company Philip Morris International (Marlboro). It was a 2001 report about the impact of smoking on the Czech Republic. The report stated that smoking was financially good for the country, since smokers died earlier from things like lung cancer and emphysema/COPD, so the country wouldn't need to pay for smokers' retirements. The report also said that buying cigarettes raised revenue for the country, so we should encourage more people to smoke. When this report came out, many people became upset and argued that people dying early was bad for the country, so Philip Morris International apologized and retracted the report.

I find this story funny for several reasons. One reason is that OF COURSE a tobacco company would try to put a positive spin on smoking! Another reason is that it's silly to think that primary care doctors are losing the country money by helping patients stay healthier. Preventing disease is usually cheaper than

treating disease. For example, lowering cholesterol is cheaper than getting heart surgery after a heart attack. It's also expensive to take care of sick people in the hospital. Additionally, if I can keep people healthier, then they'll probably contribute more to society during their life. They deserve their retirement benefits!

CHAPTER FOUR

Routine Testing

THE CHECKUP

How often should you see your provider? I'd say it depends on how sick you are. Young people with **no health problems** probably don't need to see their provider every year; they could probably get away with seeing their provider every three years. However, OhioHealth removes you from your primary care provider's patient list if you haven't seen them in over three years, so seeing me at least every two years is a good idea.

When I talk about health maintenance with patients, I like to know about many things:

- Your medical history, including current and past problems
- Your family history (some problems can be hereditary, especially certain cancers)
- Your occupational history (helps me estimate your medical knowledge, wear and tear on your body, etc.)
- Your substance use history (helps me estimate the negative effects of alcohol, nicotine, etc.)
- Your dietary and exercise habits (help me estimate your health risks)
- Your immunization records (help me catch you up on

missing immunizations)
- And more!

I also like to discuss what tests you should get. Sometimes the testing recommendations are flexible, so if you hate needles, then be glad that you don't always "need" to get your blood drawn!

I tried to include as many relevant recommendations as I could below. **Remember that the recommendations generally apply to people WITHOUT significant problems.** If you have a diagnosis or new symptoms, you should talk with your provider about what tests you need. Also, if you only have a short amount of time left to live (e.g. less than 10 years), then some of these tests probably aren't worth doing, since screening doesn't provide many short-term benefits. For example, an end-of-life cancer patient doesn't really need to care about how good their cholesterol is.

THE MORE COMMON TESTS

The very first screening tests you got were probably done right after birth! We check newborns for genetic diseases, hearing issues, and more. During childhood, we also sometimes check for anemia and lead poisoning. Lead testing is important in children who live in homes built before 1978, and especially before 1965.

Common screening tests we get at almost every visit are your weight and vitals (e.g., blood pressure, temperature, and heart rate). These are easily gotten bits of information that can be useful to check for obesity and hypertension, but they're also useful for evaluating a lot of acute complaints, like a cough.

High cholesterol:

The recommendations for screening are unclear. At the very latest, you should get a lipid test when you're 40 years old, which is when the results are often meaningful. At the very earliest, you could get a lipid test when you're 9 years old, though the evidence supporting this is weak. If you had a normal lipid test between 17 and 21 years old, you probably don't need another test until you're 25 to 35 (for men) or 35 to 45 (for women). I tend to check people earlier and more often when they have more risk factors for cardiovascular disease, like obesity, high blood pressure, diabetes, smoking, and relevant family history. People with normal lipid tests should get them rechecked every three to five years. People who have had several normal lipid tests can probably stop getting lipid tests around age 65 to 75.

High sugar:

The recommendations for screening are unclear as well. We should probably be testing most people by age 45. If you're overweight, have high blood pressure, or have high lipids, then testing you at a younger age (age 18 or 35) is reasonable. If the tests come back normal, then testing every three years is fine. If the tests show prediabetes (borderline diabetes), then testing annually is reasonable, though I'll sometimes test people sooner if I expect to see a difference.

Genetic testing for cancer:

Screening may be a good idea for people with a concerning personal history or family history. There are different ways to decide who should get genetic testing, so I'll focus on the recommendations that I'm familiar with. If you have a first- or second-degree relative who developed any of the following, then

you may benefit from genetic testing (if those relatives weren't tested already):

- female breast cancer (especially if diagnosed when younger than 50 years old, lobular combined with stomach cancer, or triple-negative)
- male breast cancer
- most pancreatic cancers
- prostate cancer (especially aggressive ones)
- invasive ovarian/fallopian cancer
- primary peritoneal cancer

People with Ashkenazi Jewish ancestry or a lot of family members with breast, ovarian, pancreatic, or prostate cancer at ANY age may also benefit from genetic testing. If you test positive for a mutation, it may affect how we'll test you in the future (like having you do breast MRIs), and your children may want to get tested later. I can refer you to a genetic counselor if you're interested in testing.

Breast cancer:

Screening usually starts at age 50, but it can start at age 40 for people who are interested. We don't test people younger than 40 because the risk of breast cancer is very low, and denser breasts are tougher to image anyway. Mammograms are the most common test. 3D mammogram (also known as digital tomosynthesis) may improve cancer detection rates. The radiation dose is about 0.5 mSv. Ultrasounds aren't typically recommended, since they tend to "accidentally" find benign lumps more often, which leads to a lot of unnecessary breast biopsies and a minimal difference in cancer detection. Similarly, women who get routine mammograms and **aren't at high risk for breast cancer** are NOT advised to get yearly breast exams from

their provider, due to a concern for "accidental" findings as well. Self-breast exams aren't usually recommended either, but I believe they can empower women and raise awareness. You can calculate your risk for breast cancer with the Gail Model online, or just ask me! Testing should be done every one to two years. We sometimes stop testing women after they turn 75.

Cervical cancer:

Screening should start at age 21. Even if you're not sexually active yet, you can still get cervical cancer! People often confuse pap smears with other GYN swabs like sexually transmitted infection (STI) swabs, but they're actually different swabs. We don't recommend pap smears before 21, due to the low risk of cervical cancer at this age and potential harms related to overtesting false positives. When you turn 21, you generally get a pap smear every 3 years. When you turn 30, you generally get a pap smear with an HPV test every 5 years. If you have any abnormal tests or certain risk factors (like having HIV or being on immunosuppressants), you may need to get more frequent pap smears, but in most people, you don't need a pap smear every year. Once you turn 65, you may be able to stop getting pap smears.

Colon cancer:

Screening should be started at age 45. If you have a first-degree relative who had colon cancer, you should start screening at 40 years old or 10 years before your relative was diagnosed with colon cancer (whichever is earlier). Colonoscopies are recommended the most due to their accuracy and ability to remove polyps that might turn into cancer later, but colonoscopies are also more inconvenient than stool tests and involve procedure-related risks. Stool tests that detect blood in

the stool (a sign of possible cancer) may be done every 1 to 3 years depending on the type of test. Most people should stop screening at age 75 or 85. Doing a combination of tests (e.g. colonoscopy every 10 years PLUS stool tests every year) increases the chances of us finding cancer, but also increases the chances of you getting extra unnecessary colonoscopies.

Prostate cancer:

Screening usually starts around 50 years old, but high-risk people (e.g., Black men or a family history of prostate cancer) can start checking at around 40 years old. The nice thing is that digital rectal exams (*a comedy classic*) are no longer the test of choice — phew! Instead, we check a prostate-specific antigen (PSA) blood test. As mentioned above, there isn't an exact PSA level that means that you have prostate cancer, but higher numbers are more concerning. Generally, a PSA of 4 ng/mL or higher should result in a referral to a urologist. What to do with a level under 4 ng/mL may depend on the age of the person being tested. If you're taking a medication like finasteride, your PSA level should be adjusted and monitored for any increases higher than 0.5 ng/mL between tests. For everyone else, a fast increase in PSA is NOT a good measure of estimating prostate cancer risk.

Skin cancer:

A full-body check should probably be done on high-risk patients every year, though shorter or longer intervals may be recommended. High-risk patients include white adults over 50 years old, people with over 50 to 100 moles, people who are immunosuppressed, people with very sun-sensitive skin, and people with a family history of melanoma. People should also see a skin specialist if they have any concerning moles; concerning moles are typically over 5 to 6 mm in diameter, asymmetric,

multi-colored, or have non-smooth borders. People with light skin should use sun protection, like sunscreen with an SPF of at least 15.

Anemia:

Not everyone needs to be screened, but it's more beneficial to screen higher-risk people, such as people who lose blood (e.g. some premenopausal women) or aren't getting enough iron (e.g. some vegetarians). Screening involves getting a blood test for a complete blood count (CBC) with or without an iron level.

Underactive thyroid (hypothyroidism):

Screening in people without any symptoms is probably unnecessary, but it can be done for people at higher risk, such as people with a family history of autoimmune diseases or previous severe concussion(s). I usually also offer thyroid testing to people who are overweight, since weight gain is a symptom that can fly under the radar. I'm not aware of any guidelines that recommend screening for an OVERACTIVE thyroid (hyperthyroidism), but I offer testing to people who have a family history of hyperthyroidism or are underweight. A thyroid-stimulating hormone (TSH) blood test is what we check.

Vitamin D deficiency:

Screening may be done in people who are at high risk for vitamin D issues, such as people with limited sun exposure, obesity, and low bone density. Since Ohio doesn't get a lot of sun (like most locations that are far north of the equator), many of my patients are at higher risk for deficiency. I discuss vitamin D in more detail in my chapter on supplements, as well as risk factors for other nutritional deficiencies (like vitamin B12 in vegans).

Kidney and liver disease:

Guidelines about screening for these are unclear. It's reasonable to check higher-risk people, like people with high blood pressure, diabetes, obesity, alcohol use, and a relevant family history. Tests are available through blood (creatinine and liver enzymes) and urine (albumin).

HIV and **hepatitis C:**

Screening at least once in a person's life is recommended for many people between the ages of 15 to 79. Interestingly, we used to only screen for HIV in adults who were high-risk, but we learned that there's no easy way to figure out if someone is high-risk. Generally, high-risk people include men who have sex with men, people with multiple partners, and IV drug users. Of course, testing for other STIs is also reasonable for high-risk people, like a yearly gonorrhea and chlamydia test. These are usually done through blood, urine, or vaginal tests.

Depression:

Screening is recommended and often done with a questionnaire at the office. The exact details of when and how often to screen are unclear.

Low bone density (osteoporosis):

Screening should be done in all women 65 years of age and older, postmenopausal women under 65 years old who are high-risk (e.g., previous fracture, a family history of hip fracture, or certain medical conditions), and all men who are high-risk (e.g., shrinking 1.5 inches in height, previous low-trauma fractures, and other medical conditions). Testing is done with a bone scan. The radiation dose is very low — less radiation than a chest X-ray.

Immunizations:

There are FAR too many vaccines to talk about here, but we can discuss them at our next appointment. If you have any medical conditions, then you might need different vaccines. For example, a smoker should get a pneumonia vaccine. **If possible, please bring your immunization records with you whenever you get a new primary care provider.** I believe vaccines can be safe and beneficial, but I understand that people have different feelings about them.

THE LESS COMMON TESTS

Electrocardiogram (EKG/ECG):

It's unclear how useful a yearly EKG is for people without symptoms of cardiovascular disease (e.g., chest pain and heart racing). An EKG basically involves putting stickers on your chest to look at the activity in your heart. There's evidence AGAINST doing a yearly EKG for healthy people. This is because EKGs have poor sensitivity and specificity, so making decisions based on their results may cause more harm than good in healthy people without symptoms. Even for unhealthier people, the benefits aren't clear. Some medications (like citalopram) may alter heart intervals on EKGs, so it's reasonable to check an EKG if you're taking these medications, especially when these medications are started or adjusted.

Plaque in the blood supply to the heart:

This can be checked by doing a cardiac calcium CT scan. This test can estimate the amount of plaque in the arteries around the heart, which might help us make decisions on whether or not you

should be on medications like aspirin. Unfortunately, this test isn't usually covered by insurance. There's some radiation exposure (1 mSv), so we generally only recommend doing this test in people who are at least 40 years old and are at medium risk for atherosclerotic cardiovascular disease. People with very low risk or very high risk probably don't need to get this done, since it's unlikely that the results would change what we do. For example, a person with very low risk probably won't need to fix any plaque with cholesterol medication, and a person with very high risk would probably benefit from taking cholesterol medication. Repeating a CAC test can be done every five years, but it probably won't change any decisions if the first test already showed a very high score.

Fun fact: Cholesterol medication may actually thicken plaques in the arteries to make them less likely to dangerously rupture, so repeating a CAC test to see if a cholesterol medication is "working" is NOT recommended.

Ovarian cancer:

Screening is recommended for people with a genetic mutation, but it isn't recommended for the average female. Screening can be done through ultrasounds and blood tests, though the evidence behind this isn't strong.

Pancreatic cancer:

Screening is recommended for people with at least two first-degree relatives with pancreatic cancer or people who have a genetic mutation. Screening is usually done through a referral to a gastroenterologist.

Lung cancer:

An annual low-radiation lung CT scan is recommended for

people between the ages of 50 and 80 who are at high risk for lung cancer. People who are high-risk include those who have smoked for at least 20 pack-years and are either former smokers or quit within the last 15 years. The radiation dose is about 2 mSv.

Carotid artery disease and peripheral artery disease:

Screening is NOT recommended. There have been private companies (like LifeLine) that sell these tests to older adults. However, these tests aren't very helpful, since people WITHOUT symptoms (like extremity pain and near-fainting) don't seem to benefit from treatment. If you want to buy these tests out of curiosity, or if you think that knowing your results will affect how seriously you'll take care of your body, then go ahead and do them. Otherwise, save your money and buy yourself something nice!

FINAL THOUGHTS

OK, that should cover everything I wanted to say about screening!

If you're ever wondering if you should be fasting for any test, ask your provider! Fasting usually means not having any food or drink except water for at least 8 hours before your test. It's also usually OK to drink other calorie-free liquids while fasting, like plain tea and black coffee. I know some of you need your morning fix.

CHAPTER FIVE

Supplements

SUPPLEMENTS? SUPPLE-MAYBE

I sometimes get asked about vitamins, herbs, and other products that would be considered supplements. The medical system doesn't spend much time teaching students and doctors about supplements besides vitamins (I had one or two lectures on herbs), so most of my knowledge about supplements is self-taught.

My goal in this chapter is to tell you which supplements are helpful and safe.

I think the supplement market tends to oversell people on the health benefits of their products. For the most part, if you don't have issues such as gastrointestinal problems or heavy alcohol use, and eat a variety of foods, you won't need to take any supplements! **After all, it's usually better to get your daily intake of nutrients from food rather than from supplements.** Taking supplements also makes it more likely for you to accidentally get more than what your body can handle.

There ARE some supplements that have benefits, but some can cause as much harm as traditional medications. Think about it

this way: if a supplement worked well, it would probably get scooped up by a pharmaceutical company and turned into a medication! For example, foxglove was turned into a heart medication called Lanoxin. However, I understand that some people don't like taking prescription medications.

Herbs are especially difficult to judge, due to potential differences in herb quality, storage conditions, and so on, so I won't discuss them in this chapter. There are also MANY herbs, so it makes more sense for me to discuss ones in the chapters that they're relevant to.

The National Institutes of Health has a good website about supplements at ods.od.nih.gov.

I summarize a lot of my findings at the end of this chapter.

Before I go further, I'd like to talk about one of the attending doctors who taught me and my co-residents. Let's call him Dr. X. Dr. X was a great teacher and strongly believed that vitamin D was not as useful as some people made it out to be. It was rare for him to recommend vitamin D for a patient. If we ever talked about prescribing vitamin D, he would remind us about how weak the evidence was for it. Sometimes we'd shrug and ask, "What's so bad about prescribing vitamin D? It won't hurt anyone." He'd reply with something like, "How many useless pills would you like the patient to take?"

Because of his advice, I usually only push vitamin D for the SEVERELY deficient. For people who are only mildly deficient, I try to explain the research and let them decide if they want to supplement.

Now that you understand where I'm coming from, let's continue!

NUTRIENTS

The following recommendations are directed toward most **healthy non-pregnant adults** in the United States (unless otherwise stated).

Chromium:

- Deficiency: rare.
- Good sources: many foods.
- Symptoms of deficiency: increased insulin use in malnourished patients in hospitals.
- Toxicity: Moderate doses seem safe. Data is limited.
- Suggested daily intake: 20-35 mcg.
- Benefits of taking: unclear.
- Test: no validated test for general status.

Copper:

- Deficiency: rare. Might happen in people who take too much zinc or iron, since copper, zinc, and iron possibly compete with each other in the gut.
- Good sources: many foods.
- Symptoms of deficiency: mostly problems in the hair, nervous system, and blood cells.
- Toxicity: >10,000 mcg per day can cause stomach pain, death, and more.
- Suggested daily intake: 900 mcg.
- Test: unreliable.

Fluoride:

- Deficiency: rare.
- Good sources: water and toothpaste.
- Symptoms of deficiency: mostly dental cavities in kids.
- Toxicity: >0.7 mg in kids or >10 mg per day in adults can form white spots on the teeth and lead to death at very high doses.
- Suggested daily intake: 3-4 mg for adults.
- Test: no validated test.

Iodine:

- Deficiency: rare in most first-world countries.
- Good sources: water, food, and table salt.
- Symptoms of deficiency: mostly thyroid issues.
- Toxicity: >1100 mcg per day can cause thyroid issues.
- Suggested daily intake: 150 mcg.
- Test: The iodine urine test can assess recent intake, and a thyroglobulin blood test can assess longer-term status.

Iron:

- Deficiency: somewhat common in premenopausal females and frequent blood donors. NOT common in men (about 1-2%).
- Good sources: meat. Some non-meat products contain iron, but they aren't absorbed as well.
- Symptoms of deficiency: mostly anemia and fatigue.
- Toxicity: >45 mg per day (if not deficient) can cause things like liver disease, constipation, and copper/zinc deficiency.
- Suggested daily intake: 8 mg, but people who menstruate may need 18 mg. Taking iron with vitamin C may

increase the absorption of iron, but the research is weak. Calcium supplements should be taken at least 2-4 hours apart from iron, but it's not that big of a deal.

- Test: available, but results may be affected by inflammation.

Manganese:

- Deficiency: rare.
- Good sources: many foods.
- Symptoms of deficiency: unclear.
- Toxicity: >11 mg per day can cause problems like brain damage.
- Suggested daily intake: 1.8-2.3 mg.
- Benefits of taking: unclear.
- Test: no validated test.

Selenium:

- Deficiency: rare. Happens more often to people on dialysis, though it's easier for people on dialysis to OVERDOSE too.
- Good sources: many foods.
- Symptoms of deficiency: mostly muscle and mood problems.
- Toxicity: >400 mcg per day can cause things like nausea, diabetes, hair/nail loss, and death. **It's possible to exceed the recommended daily selenium intake just from food.** Notably, Brazil nuts contain a lot of selenium (potentially 91 mcg per nut).
- Suggested daily intake: 55 mcg.
- Benefits of taking: unclear.
- Test: Blood and hair can show recent selenium intake, but nail and hair samples are required to monitor longer-

term intake. I've never seen anyone test for selenium.

Zinc:

- Deficiency: unclear. Might be rare (<4%) or common (45%)! Happens more often with sickle cell disease.
- Good sources: mostly meats and fortified breakfast cereals.
- Symptoms of deficiency: mostly problems with maturation, skin, hair, and taste.
- Toxicity: >40 mg and especially >150 mg daily may cause headaches, stomach complaints, and copper/iron deficiency.
- Suggested daily intake: 8-11 mg.
- Benefits: unclear.
- Test: unclear validity, but the blood test may be more accurate in healthy people.

Vitamin A:

- Deficiency: rare.
- Good sources: There are mainly two types of vitamin A. Preformed vitamin A is found in animal sources (like retinol). Carotenoids are found in plants (like beta-carotene). Preformed vitamin A is more likely to cause toxicity than carotenoids are.
- Symptoms of deficiency: mostly problems with the eyes, bones, and immune system.
- Toxicity: >10,000 mcg of preformed RAE per day may cause problems like liver and bone disease. >3,000 mcg of preformed RAE per day may cause birth defects. >10,000 mcg carotenoid RAE per day may be harmful to patients with diseased lungs.
- Suggested daily intake: 700-900 mcg RAE.

- Benefits: treats measles and other conditions.
- Test: The retinol blood test may be able to detect deficiency, but is affected by inflammation.

Vitamin B1 (thiamine):

- Deficiency: uncommon (6%). Happens more often in people with alcoholism, HIV, and diabetes.
- Good sources: mostly pork and enriched grains.
- Symptoms of deficiency: mostly nerve issues.
- Toxicity: never demonstrated.
- Suggested daily intake: 1.2 mg.
- Test: transketolase activity blood test.

Vitamin B2 (riboflavin):

- Deficiency: uncommon (<6%), and a "pure" deficiency of B2 (without deficiency of other B vitamins) has never been seen in the United States. Happens more often in vegans.
- Good sources: most foods, especially dairy and fortified cereals.
- Symptoms of deficiency: mostly inflammation in the mouth and lips.
- Toxicity: never demonstrated.
- Suggested daily intake: 1.3 mg.
- Benefits: may be helpful for migraines.
- Test: The erythrocyte glutathione reductase activity coefficient (EGRAC) test is somewhat accurate.

Vitamin B3 (niacin):

- Deficiency: rare. Happens more often with alcoholism.
- Good sources: most foods, especially meat. The two primary forms of niacin are nicotinic acid and

nicotinamide.

- Symptoms of deficiency: mostly pellagra, which can lead to a photosensitive rash, diarrhea, dementia, and death.
- Toxicity: 10-1,000 mg of **nicotinic acid** per day may cause harmless flushing. Higher amounts (>1,000 mg per day) of nicotinic acid may lower LDL cholesterol (with a neutral effect on your health), but may also cause gout and liver damage. On the other hand, **nicotinamide** doesn't seem to cause liver damage at doses of 3,000 mg or less per day. No toxicity has been reported from consuming natural niacin **in food**. Inositol is a "flush-free" supplement that provides niacin, but it might not be absorbed as well.
- Suggested daily intake: 14-16 mg.
- Test: 24-hour urine.

Vitamin B5 (pantothenic acid):

- Deficiency: rare.
- Good sources: many foods, especially liver and fortified cereals, although eating too much liver may cause **vitamin A** toxicity.
- Symptoms of deficiency: mostly burning and tingling in the extremities.
- Toxicity: never demonstrated.
- Suggested daily intake: unclear, but it appears that 5 mg is enough.
- Test: 24-hour urine.

Vitamin B6 (pyridoxine):

- Deficiency: probably rare. Happens more often with alcoholism, autoimmune disease, kidney disease, and more.

- Good sources: most foods.
- Symptoms of deficiency: problems like seizures and depression.
- Toxicity: 100 mg or more per day may cause nerve damage and dizziness.
- Suggested daily intake: 1.5-1.7 mg.
- Test: PLP blood test.

Vitamin B7 (biotin):

- Deficiency: rare. Happens more often in people who frequently eat many raw egg whites.
- Good sources: many foods, especially liver and eggs.
- Symptoms of deficiency: mostly skin and nerve problems.
- Toxicity: never demonstrated. Taking biotin may cause several blood tests to be inaccurate, such as thyroid tests and testosterone tests, so it's recommended to **pause your biotin supplement for 48 to 72 hours** before getting your blood drawn.
- Suggested daily intake: unclear, but 30 mcg is probably enough.
- Test: urine biotin.

Vitamin B9 (folate):

- Deficiency: rare, but more intake is required during pregnancy.
- Good sources: many foods. There are different forms of folate, but folic acid is the most-studied and most-recommended.
- Symptoms of deficiency: mostly anemia and nerve issues.
- Toxicity: unclear. >1000 mcg per day of folic acid may hurt the immune system and lead to cancer. Getting a

high amount of folate **from food** doesn't seem to cause toxicity, and research is currently being done to determine if alternative forms of folate (like methylfolate) are safer than folic acid supplements.
- Suggested daily intake: 400 mcg of dietary folate equivalents (DFEs) in non-pregnant adults. 600 mcg in pregnant adults.
- Test: blood test. Metabolite testing can be done for borderline cases.

Vitamin B12 (cobalamin):
- Deficiency: fairly common (around 1 to 6% in young individuals and 5 to 20% in people older than 60). Happens more often in vegans.
- Good sources: mostly meat and animal products.
- Symptoms of deficiency: mostly anemia and nerve issues.
- Toxicity: never demonstrated.
- Suggested daily intake: 900 mcg.
- Test: blood test. Metabolite testing can be done for borderline cases.

Vitamin C (ascorbic acid):
- Deficiency (scurvy!): rare.
- Good sources: many fruits and vegetables, especially oranges. Breast milk contains enough vitamin C for children.
- Symptoms of deficiency: mostly bleeding hair and gums.
- Toxicity: 1,000 mg or more per day can cause kidney stones and bloating. Doses of 250 mg or higher per day may cause a colon cancer FOB test to read negative, so **stopping your vitamin C for at least 3 days before the test is recommended**.

- Benefits: unclear. Some research suggests that people who take at least 200 mg of vitamin C daily may have slightly milder colds (5% less severe) and slightly shorter colds (8% shorter), though starting vitamin C after getting a cold doesn't appear to do much.
- Suggested daily intake: 75-90 mg, but smokers require about 35 mg more.
- Test: The blood test is somewhat accurate.

Vitamin D (calciferol):

- Deficiency: more common in older people and areas without sun.
- Good sources: Unfortunately, very few foods naturally contain vitamin D.
- There's a lot of ongoing research about vitamin D, and the science isn't clear yet. There are many guesses:
    - Severe deficiency (blood levels less than 12 ng/mL) seems to increase the risk of developing poor bone density.
    - Weak evidence suggests that a vitamin D level below 20 ng/mL (and especially below 10 ng/mL) may cause muscle weakness and decreased lifespan in patients who are 60 years old or older.
    - Weak evidence suggests that a vitamin D level ABOVE 30 ng/mL (and especially above 40 or 50 ng/mL) may be associated with negative effects, like decreased lifespan.
    - On the other hand, some experts believe that older adults should achieve at least 30 ng/mL.
    - Giving high doses of vitamin D monthly or annually (like 60,000 IU, rather than smaller doses daily or weekly) may increase the risk of

falls in elderly patients.

Confusing, right? We haven't determined if vitamin D supplementation in patients who already have good levels of vitamin D is helpful for cancer, infections, heart disease, bone density, or anything else. For example, some studies say that taking vitamin D can INCREASE the risk of cancer, while others say that it can DECREASE the risk of cancer.

- Toxicity: may occur when taking >4,000 IU daily, and seems to occur when your levels are >100 ng/mL. At very high levels, vitamin D can cause problems like calcium deposits in organs, weakness, and death. Sunlight alone doesn't cause us to reach toxic levels.
- Suggested daily intake: 800 IU. D3 is absorbed a little better than D2.
- Test: 25(OH)D blood test.

Vitamin E (tocopherol):

- Deficiency: probably rare.
- Good sources: many foods.
- Symptoms of deficiency: mostly nerve issues.
- Toxicity: unclear. Natural vitamin E (RRR-alpha-tocopherol, which is similar to d-alpha-tocopherol) is less toxic than synthetic "all-racemic" vitamin E, so be careful when reading the label: 1 mg of alpha-tocopherol is equivalent to 1.49 IU of natural vitamin E or 2.22 IU of synthetic vitamin E. Weak research has shown that taking >50-180 mg per day may increase your risk for bleeding and prostate cancer. No negative effects have been seen from getting vitamin E naturally **from food**.
- Benefits: Some evidence supports vitamin E use in fatty liver, Alzheimer's disease, and age-related macular degeneration.

- Suggested daily intake: 15 mg.
- Test: The alpha-tocopherol blood test is possibly accurate, but must be readjusted in patients with abnormal protein or lipid levels.

Vitamin K:

- Deficiency: rare.
- Good sources: spinach, kale, broccoli, and more.
- Symptoms of deficiency: mostly easy bleeding.
- Toxicity: rare. The upper limit has not been discovered.
- Benefits: Weak evidence shows that vitamin K may prevent osteoporosis (mostly in postmenopausal Japanese women) and coronary artery disease.
- Suggested daily intake: Most adults don't need more than 120 mcg per day. There are different forms of vitamin K, but there isn't a significant difference among them.
- Test: An INR blood test can assess status, but this test can be abnormal in many conditions.

Choline:

- Deficiency: rare.
- Good sources: most foods, especially animal products like meat, dairy, and eggs.
- Deficiency: mostly muscle and liver damage.
- Toxicity: We aren't sure if choline has positive or negative effects on the heart. Taking too much (more than 3,000 mg per day) can cause vomiting and liver damage.
- Suggested daily intake: 425-550 mg. Unfortunately, some prenatal vitamins don't have enough, even though choline is important for fetal development.
- Test: blood choline test.

Calcium:

- Deficiency: fairly common. Happens more often to vegans.
- Good sources: foods including milk, yogurt, cheese, and fortified foods. Nondairy sources include certain vegetables and fish bones.
- Symptoms of deficiency: mostly decreased bone density and nerve issues.
- When I talk about mg's of calcium, I'm referring to **elemental calcium.** For example, 1250 mg of calcium carbonate contains 500 mg of elemental calcium, so check the labels!
- Toxicity: >2,500 mg per day (or >2,000 mg per day for people older than 50 years old) may cause problems like kidney stones and heart disease. **Natural calcium** seems safer than supplements.
- Benefits: For patients who get enough calcium from their diet, there isn't much evidence supporting supplements for cancer, bone density, blood pressure, obesity, etc.
- Suggested daily intake: 1,000 mg (or 1,200 mg for people over 70 years old). For patients taking antacids, calcium citrate is better absorbed than calcium carbonate and can be taken at any time of the day (rather than with meals), though it's more expensive. Calcium supplements also should be taken at least 2-4 hours apart from iron and thyroid supplements to avoid absorption issues, though the interaction with iron isn't that big of a deal. We typically don't recommend supplements that contain more than 500 mg, since higher doses aren't absorbed as well.
- Test: Calcium blood tests can estimate circulating levels, but aren't good at estimating general status. A bone

density scan can estimate lifetime nutritional status, since bones store almost all of the body's calcium.

Potassium:

- Deficiency: probably common. On the bright side, it's rare for patients with healthy kidneys to have extremely low or extremely high levels of potassium, since the kidneys can regulate the levels.
- Good sources: many foods.
- Symptoms of deficiency: mostly high blood pressure, kidney stones, and heart disease.
- Toxicity: extremely high blood levels may cause the heart to stop.
- Suggested daily intake: 2,600-3,400 mg. There are different forms of potassium, but potassium chloride is absorbed the most efficiently. It's difficult to reach recommended intakes through supplements alone, since supplements over 99 mg of potassium may cause intestinal bleeding.
- Test: A potassium blood test is adequate. Sometimes the result will be falsely high.

Magnesium:

- Deficiency: It's unclear how common it is, but surveys show that the average person consumes less magnesium than recommended. Fortunately, healthy kidneys are good at keeping your level normal.
- Good sources: many foods.
- Symptoms of deficiency: mostly fatigue, nausea, low calcium, and low potassium.
- Toxicity: >350 mg per day may cause diarrhea. >5,000 mg per day may cause death. It's almost impossible to

overdose **from food**.

- Benefits: may prevent migraines.
- Suggested daily intake: 320-420 mg. Most people shouldn't take supplements that contain >350 mg of supplemental magnesium unless they're being supervised by a medical professional. There are different forms of magnesium, but sustained-release forms are the least likely to cause diarrhea.
- Test: A magnesium blood test is adequate.

SUMMARY

These supplements are most likely harmless and may or may not be helpful:

- **Vitamin B1 / thiamine**
- **Vitamin B2 / riboflavin**
- **Vitamin B5 / pantothenic acid**
- **Vitamin B7 / biotin**
- **Vitamin B12 / cobalamin**
- **Vitamin K**

These may or may not be useful (be careful about the dose):

- **Vitamin A** (700-900 mcg RAE is adequate; 3,000 mcg RAE is risky)
- **Vitamin B3 / niacin** (14-16 mg is adequate; 1,000 mg is risky)
- **Vitamin B6 / pyridoxine** (1.5-1.7 mg is adequate; 100 mg is risky)
- **Vitamin B9 / folate** (400 mcg DFE is adequate or 600 mcg DFE during pregnancy; 1,000 mcg is risky)
- **Vitamin C / ascorbic acid** (75-90 mg is adequate; 2,000 mg

is risky)
- **Vitamin D** (600-800 IU is adequate; 4,000 IU is risky)
- **Vitamin E / tocopherol** (15 mg is adequate; 1,000 mg is risky)
- **Chromium** (20-35 mcg is adequate; toxic dose is unknown) for diabetics
- **Iodine** (150 mcg is adequate; 1,100 mcg is risky)
- **Iron** (8-18 mg is adequate)
- **Manganese** (1.8-2.3 mg is adequate; 11 mg is risky)
- **Zinc** (8-11 mg is adequate; 40 mg is risky) deficiency may be common, but taking excess may cause deficiencies in iron and copper
- **Calcium** (1,000-1,200 is adequate; 2,000-2,500 is risky)
- **Choline** (425-550 mg is adequate; 3,000 mcg is risky)
- **Potassium** (2,600-3,400 mg is adequate; taking over 99 mg at a time is risky)
- **Magnesium** (320-420 mg is adequate; 350 mg OF SUPPLEMENT is risky)

Avoid these in most people, since the risks seem to outweigh the benefits:
- **Copper** (900 mcg is adequate; 10,000 mcg is risky) may cause deficiencies in zinc and iron
- **Fluoride** (4 mg is adequate; 10 mg is risky) might be useful for kids with dental risk
- **Selenium** (55 mcg is adequate; 400 mcg is risky) toxicity is possible from food alone

To conclude — **I'm not telling you to start buying every supplement above** (Dr. X would tear his hair out), but if you do, you should at least know the risks, benefits, and appropriate doses. **Additionally, many of these tests don't need to be checked**

in most people, and I'm not sure how expensive every test is.

Part Three

Common Problems

CHAPTER SIX

High Weight

A "HEALTHY" WEIGHT

If you're interested in losing weight, then I'd love to help! OhioHealth has a weight loss program, so I typically refer my interested patients to their program. However, I've done a bit of my own learning, including shadowing a weight loss specialist at Cleveland Clinic, so I've included what I know in this chapter.

Let's start by trying to define what a healthy weight is.

The most common method is calculating a body mass index (BMI). BMI is a person's weight (in kilograms) divided by the square of their height (in meters). You can find websites that calculate your BMI, or just ask me!

A BMI of 25 is considered overweight, and a BMI of 30 is considered obese. Asians appear to develop weight-related problems (like diabetes and high cholesterol) at lower weights, so in Asians, a BMI of 23 is considered overweight, and a BMI of 25 is considered obese. These are estimates of health, so they're less accurate in more extreme cases, like bodybuilders.

Waist circumference is an easy way to estimate how much

abdominal fat you have. Abdominal fat causes more health problems than fat in other parts of our bodies. **Strangely, the waist size of your pants may not be an accurate measure of your true waistline.** Your true waistline should be measured right above your hip bones. Maybe clothing companies are trying to flatter us?

A waist circumference of at least 40 inches in men and 35 inches in women is probably unhealthy. In Asians, a waist circumference of at least 35 inches in men and 31 inches in women is probably unhealthy. People who have a BMI over 35 will usually have a large waist circumference.

There are other ways to estimate body composition (like a DEXA scan and MRI scan). These can somewhat accurately tell us your body fat percentage. Weight from fat is less healthy than weight from muscle, and muscle weighs more than fat. However, these tests are more expensive and likely only provide useful information in extreme cases like bodybuilders or the very frail.

So, the big questions… Is obesity always unhealthy? Are there any advantages to being obese?

People who are obese are at higher risk of developing health problems and generally have shorter lifespans than people with lower weights. Here are some health problems that are more common in heavier people:

- high blood pressure
- high cholesterol
- heart disease
- strokes
- sleep apnea

- gout
- arthritis
- kidney disease
- liver disease
- heartburn
- gallstones
- diabetes
- vitamin D deficiency
- polycystic ovarian syndrome
- cancers

However, there are conflicting data about overweight and obese patients who ALREADY have health problems! Some research shows that they may have better survival rates than people with lower weights. This is called the obesity paradox. This might be explained by the fact that it's good to have extra fat in the body for energy when you become severely ill, like if you catch a pneumonia. Other explanations could be that the studies didn't factor in healthy muscle mass or consider that thinner people could have lost their weight from unhealthy issues like smoking. So, if you're already "unhealthy", then be aware that some research recommends keeping your BMI between 22 and 35!

However, I want to emphasize that the obesity paradox doesn't apply as much to people with more severe obesity, so **having a BMI over 35 will probably do more harm than good.** Additionally, there's a lot of research suggesting that overweight or obese patients with health problems will probably become healthier if they lose weight. **Therefore, it's possible that the obesity paradox isn't accurate**, and that a BMI between 22 to 25 is the healthiest range for most people, with Asians possibly having a different optimal range.

CAUSES OF WEIGHT GAIN

Obesity is somewhat hereditary. If one of your parents was obese, then you're about two to three times more likely to become obese. If both of your parents were obese, then you're up to 15 times more likely to become obese. Women who are heavier during pregnancy also tend to birth heavier children. Children who are obese are more likely to continue being obese as adults.

Besides genetics, other factors can contribute to obesity.

Sleep deprivation can affect hormones by increasing ghrelin and decreasing leptin. This imbalance in your body makes you feel hungry. I discuss ideal sleep times in my chapter about insomnia.

Medications may cause weight gain as well, like certain antidepressants and oral steroids. You can discuss medication-related concerns with your provider.

Aging may cause weight gain. We naturally gain belly fat as we get older, due to changes in hormones.

Other hormonal causes of weight gain (like low thyroid hormone or a cortisol-producing tumor) are less common. Ask your provider if you should be tested!

Lack of exercise can cause weight gain, and leading a sedentary lifestyle can shorten your life.

Lastly, an unhealthy diet and high caloric intake are the biggest

contributors to weight gain.

LOSING WEIGHT WITHOUT MEDICATION

How fast should you lose weight? Losing about one to two pounds per week is ideal since this seems to help people keep the weight off permanently. Also, losing weight too quickly may cause gallstones and other issues.

Weight loss can be achieved through multiple methods: diet, exercise, medication, surgery, and medical devices. Diet and exercise should be tried first!

Devices aren't usually covered by insurance. Weight loss supplements (like ephedra) aren't recommended due to safety concerns and/or a lack of effectiveness. Liposuction doesn't seem to improve health outcomes — you're skinnier, but not healthier! Acupuncture may help with weight loss, but the evidence is weak.

Let's talk about diet first. **There's no "best diet".** There are many good diets out there, so you should try to find one that works for you. If you're having a lot of trouble sticking to a diet, then maybe try adjusting the diet to your preference or try switching to another diet plan. No matter what diet you choose, the two important factors are the number of calories you eat and how healthy the food is.

You can start by estimating how many calories you should eat every day. Special equipment can estimate how many calories you burn per day, but you can also estimate this with a bit of

math, thanks to a formula developed by the World Health Organization:

- For men 18 to 30 years old: 0.0630 x weight in kg + 2.8957
- For men 31 to 60 years old: 0.0484 x weight in kg + 3.6534
- For women 18 to 30 years old: 0.0621 x weight in kg + 2.0357
- For women 31 to 60 years old: 0.0342 x weight in kg + 3.5377

Multiply your answer by 240, then multiply by 1.7 (if you're very physically active), 1.5 (if you're moderately active), or 1.3 (if you're fairly sedentary). Subtract 500 from this answer, and this final number is the number of calories you should eat every day to lose about 1 pound per week. Again, this is an estimate, so it might take some time for you to figure out where your personal calorie target should be.

If you're curious about why gender and age mattered above — men generally lose weight faster than women because they have more muscle mass, which lets them burn calories faster. Older people have lower metabolic rates.

Calorie-tracking isn't easy, so you may find it helpful to keep a food diary or use an app on the phone or computer to help you keep track of everything. I've personally used and recommended the "Lose It!" app, but there are other good apps out there.

Very-Low-Calorie Diets (under 800 calories per day) may cause you to lose weight too quickly, so they aren't recommended for most people. There's also some research that shows that your body's metabolism may slow down when eating too few calories,

which makes losing weight harder, so a 400-calorie diet probably doesn't cause more weight loss than an 800-calorie diet. Also, most people (even people with a slow metabolism) will lose weight on a 1,200-calorie diet.

Intermittent fasting isn't necessarily superior to other strategies for weight loss, but it may be an easy diet for some people to follow.

Some simple advice for a healthy diet:

- REDUCE your intake of processed meats, refined carbohydrates, and trans fats.
- INCREASE your intake of fruits, nuts, fish, vegetables, whole grains (e.g., brown rice and whole wheat), legumes, and yogurt.
- MODERATE your intake of poultry, eggs, and milk.
- Unprocessed red meat is also OK in moderation, but it may be less healthy than fish and poultry.

It's usually more important to choose a healthy, calorie-controlled diet than to be overly focused on hitting specific nutrient goals (like low-fat, low-carb, or high-protein). Examples of healthy diets include the Mediterranean Diet and DASH Diet, which have both been shown to improve heart health.

In regards to carbohydrates, it appears that food with low glycemic index and glycemic load (i.e. foods that raise your sugar gently instead of quickly) may be better for weight loss and health by reducing hunger signals. For example, brown rice has a lower glycemic index than white rice. However, you shouldn't overconsume brown rice either. Non-nutritive sweeteners (like those found in diet sodas) aren't definitely better or worse than

sugar, but you should ideally stick to non-sweetened beverages like water. Non-nutritive sweeteners should be avoided in people with gut problems or people who had bariatric surgery,since these sweeteners can mess with the body's healthy gut bacteria and cause diarrhea.

In regards to fats, it appears that trans fats contribute to heart disease, while polyunsaturated fats and fish oil reduce heart disease. There isn't agreement about monounsaturated fats, but the evidence leans towards recommending plant-based monounsaturated fats like olive oil and avocados. It's not clear how harmful saturated fats are, but we suggest limiting saturated fat intake to under 10% of your calories per day.

In regards to proteins, you should choose proteins like fish, lean meat, poultry, eggs, beans, peas, soy products, nuts, and seeds. Avoid proteins that contain unhealthy fats. There's some research which shows that protein can make you feel full for longer and prevent you from gaining back the weight you lost, but we're not sure if this is true.

Soluble fiber (like in oats) appears to reduce cholesterol and the glycemic index of your meal. Insoluble fiber (like in whole grain wheat) might not have those benefits, but may delay hunger by making you feel full!

Alcohol doesn't appear to be very helpful for weight loss, and the health benefits of moderate drinking (one drink per day for women and two drinks per day for men) aren't clear.

Caffeine doesn't seem to cause noticeable weight loss. There might be health benefits, but heed a couple of warnings: you

should limit caffeine to 400 mg or less per day, and coffee may increase your blood pressure. However, tea and caffeine supplements don't seem to increase blood pressure in daily caffeine users.

It's unclear if consuming organic food actually leads to better health, but there's growing evidence that supports this theory.

Exercise is generally less effective for losing weight compared to dieting, but it's important for KEEPING WEIGHT OFF since lean muscle mass burns energy. Doing a mix of aerobic exercise (e.g., jogging, cycling, swimming) and strength training is more effective than sticking to only one type of exercise.

You should get at least 150 minutes of moderate exercise or 75 minutes of vigorous exercise per week, ideally split among at least three days. People who exercise for at least 60 minutes per day have more success with losing weight. Moderate exercise usually means that you should be too out-of-breath to sing, but not too out-of-breath to talk. If you're too out-of-breath to talk, then you're probably doing vigorous exercise. Some more fairly easy ways to estimate moderate exercise are keeping your heart rate between 120 to 140, or figuring out your maximum heart rate (usually 220 minus age) and shooting for a heart rate between 50 to 85% of that. However, heart rate goals might not be accurate if you're on medication that affects your heart rate.

More accurate measures of moderate exercise are more complicated and are typically only done in a lab that measures your oxygen consumption with a mask. Vigorous exercise may not be safe for everyone, so please talk to a medical provider about it.

Sneaking in little bits of physical activity by using things like standing desks or walking desks might be helpful, but you should try to do some moderate exercise too.

Changing habits is easier with a good mindset. Here are some tips for developing a strong mental game:

- Eat more slowly and don't eat when distracted (like while watching television). This allows you to pay more attention to your fullness.
- Include supportive people like family and friends in your journey.
- If you tend to stress-eat, then work on ways to reduce stress (easier said than done!), and talk to a therapist.
- Negative self-talk like "I ate too much today — I'm a failure," should be replaced by positive self-talk like "I ate too much today — I'll exercise more and try to do better tomorrow."
- Keep your fridge and pantry stocked with healthy foods, so that you can always choose a diet-friendly option if you get hungry.
- Knowing how to plan meals and cook are useful skills, so talking to a nutritionist for guidance may be helpful.
- If you have another medical condition that makes it harder for you to lose weight (e.g. knee pain that makes it hard to exercise), work together with your medical provider to fix it!

Unhealthy habits like smoking can help you lose weight, but these aren't recommended strategies.

LOSING WEIGHT WITH MEDICATION

If you're still struggling with weight loss after trying to diet and exercise, then it might be time to think about medication. Medication should only be offered to people with a BMI of at least 30 (or 27 if they have weight-related medical problems) who haven't been able to lose at least 5% of their weight after trying for months. Again, I usually refer my patients to OhioHealth's weight management program if they're interested in medications since I think you should go through a good program before trying medications. As a result, I have little experience with prescribing medications for weight loss. However, some weight loss medications are used to treat other medical conditions, so I have indirect experience with them. For example, liraglutide is a drug that I use for diabetes that can also cause weight loss.

In general, if you haven't lost at least 4% of your body weight on a weight loss medication within 3 months, you should try something else. Unfortunately, you might gain weight back if you stop any of these medications.

Orlistat is the only FDA-approved weight loss medication that's available over-the-counter. It works by preventing your body from absorbing the fat you eat, so fat ends up coming out in your stool. Unfortunately, this means that it often causes diarrhea and lowers the absorption of fat-soluble vitamins (A, D, E, and K), so we don't recommend this as a first-choice option. There have also been rare reports of liver and kidney disease in people taking this, and it shouldn't be taken during pregnancy. Fortunately, weight loss on orlistat doesn't seem to cause gallstones. Over-the-counter dosing starts at 60 mg three times daily with any meal that contains fat, but physician-monitored dosing can go up to

120 mg three times daily. You can expect to lose about 10 to 22 pounds or 6% of your body weight on the highest dose. It may improve blood pressure and cholesterol as well.

Liraglutide and semaglutide are GLP-1 agonist drugs that are FDA-approved for weight loss. They're also approved for type 2 diabetes. Both of these medications require self-injection. Liraglutide is a daily injection, and semaglutide is a weekly injection. Semaglutide is sold as a pill too, but the pill isn't approved for weight loss yet. Both medications may improve blood pressure and cholesterol, as well as reduce deaths from cardiovascular disease. There are also potential health benefits for people with fatty liver (with liraglutide specifically) and kidney disease (with both medications). Semaglutide may be more effective than liraglutide, but it might worsen diabetic eye disease. Other negative side effects of these medications include gastrointestinal disease and kidney injury. They should be avoided in people with a family history of certain cancers (medullary thyroid and multiple endocrine 2A/2B) since these drugs caused thyroid cancer in rodents. Fortunately, we haven't seen any reports of human cancer yet, probably because humans have fewer thyroid C cells than rodents.

Stimulants can be used for weight loss, but are controlled substances regulated by state laws and have the side effects you might expect (e.g., dry mouth, mood issues, high heart rate, high blood pressure).

There's a drug that combines phentermine (a stimulant) with topiramate (used in migraines, seizures, and more), but this has similar side effects. We don't know if taking each pill individually (instead of the combined pill) works equally well, but I would

assume it does. It should be avoided in people who have medical conditions that could be aggravated by stimulants. Stopping it too suddenly may cause seizures.

There's a drug that combines naltrexone (used in alcohol and opioid addiction) with bupropion (used in ADHD, depression, and nicotine addiction). Side effects include high blood pressure, high heart rate, nausea, and headache. Interestingly, we're not sure if the naltrexone part actually helps you lose weight, but it theoretically should. This medication should be avoided in high blood pressure, seizures, eating disorders, pregnancy, opioid use, severe liver disease, and kidney stones.

The last medication I want to mention is metformin. It's technically not a weight loss medication because it doesn't consistently help people lose a significant amount of weight, but I prescribe this pretty commonly for patients with diabetes. On average, it only causes 4 lbs of weight loss or 2% of weight. Occasional side effects include diarrhea, nausea, vitamin B12 deficiency, and toxicity when very dehydrated, particularly in hospitalized patients. The weight loss doctor I shadowed sometimes checked patients for insulin resistance and prescribed metformin if they tested positive, even if the patient wasn't diabetic.

I don't feel qualified to discuss surgical options, but here are a few points about surgery:

- Surgery tends to cause more weight loss (like 60-70% of excess weight) than everything else I've described so far. People also have more success keeping off the weight.
- Gastric bypass and sleeve gastrectomies are the most common surgical options.

- You usually have to participate in various activities (like seeing a behavioral health expert) before surgery.
- In addition to surgical risks, there are also health problems that may happen after surgery, such as vitamin deficiencies and stomach ulcers.

Good luck on your weight loss journey!

CHAPTER SEVEN

High Blood Sugar

OH SO SWEET

This section will focus more on type 2 diabetes and prediabetes than other types of diabetes due to the scope of my knowledge, but some principles (like insulin management) will be relevant to anyone with high blood sugar.

To keep things simple, there are two main types of diabetes: insulin-dependent diabetes (this NEEDS insulin since pills won't work) and non-insulin-dependent diabetes (pills and insulin both work).

The most common insulin-dependent diabetes is type 1 diabetes. Typically, people develop this type of diabetes during childhood as a result of the body causing autoimmune destruction of its pancreas, which causes the pancreas to produce basically zero insulin.

The most common non-insulin-dependent diabetes is type 2 diabetes, which typically happens to people who are overweight and sedentary. It's also more hereditary than type 1 diabetes. If one of your parents has type 1 diabetes, then you have a 1-8% chance of developing type 1 diabetes. If one of your parents has

type 2 diabetes, then you have a 20% chance of developing type 2 diabetes. Interestingly, if both of your parents have ANY type of diabetes, then you have a 30% chance of developing diabetes. Ethnicity affects your chances of developing diabetes as well.

Other outside factors can cause high blood sugar, such as stress, strong steroids, thyroid disease, and pancreatitis.

How can you tell what type of diabetes you have? Generally, you can tell just by thinking about when you developed diabetes and your weight. If we're not confident about what type of diabetes you have, blood tests (like antibodies) might be helpful to check. Be wary of checking these blood tests on people who are already taking insulin, since these tests might show false positives.

Diabetes can be diagnosed through a few methods:

- Fasting blood sugar of 126 mg/dL or higher
- Hemoglobin A1C of 6.5% or higher
- Any blood sugar over 200 mg/dL PLUS symptoms of diabetes (like more thirst, more urination, weight loss, and/or blurry vision)
- A glucose drink test is usually only performed during pregnancy

If a person doesn't have any symptoms of diabetes, then they should have AT LEAST TWO abnormal tests (the same test or different tests) before we should be confident that they have diabetes.

Fun fact: The A1C test shows us how good your blood sugar has been over the last three months. It works by detecting the amount of sugar attached to your red blood cells. However, it may be falsely high or low in certain

situations (like severe kidney disease and iron deficiency), so if a patient's blood sugar readings don't seem to correlate with their A1C readings, then other tests could be checked, such as a glycated albumin or fructosamine. However, these alternative tests are generally less reliable, measure sugar over a shorter term (2-3 weeks), and may be falsely altered by imbalances in protein.

If your sugar or A1C isn't high enough to be in the diabetic range, but it isn't low enough to be in the normal range, you might have what we call "prediabetes". Prediabetes isn't as dangerous as diabetes, but it can still increase your risk of heart disease and more. Most people with prediabetes don't need to take any sugar-lowering medication.

If your tests show prediabetes, then testing again in a year is reasonable, but I'll sometimes test again in three months if I expect the sugar to be better by then. If your tests show diabetes, then testing your A1C every three months is usually recommended. You can also check your blood sugar at home, but people with stable blood sugars probably don't need to.

I've had people ask me how often I've seen people fix their diabetes without medication. My experience as a young doctor should be taken with a grain of salt, but it seems like more than half of people with diabetes end up starting medications because they couldn't get their blood sugar down with lifestyle changes alone. **Some people who start medication will eventually get off medication, partly because our definition of a "good sugar" is less strict as we get older.**

There are many problems that diabetes can cause. In the short term, having a very high sugar increases your risk of having acid

build up in your blood and going into a coma. In the long term, sugar can invade the blood vessels and nerves, causing numbness and poor circulation, which eventually leads to heart attacks, strokes, and more. It's also harder for the body to heal wounds when blood sugar is high. These are some reasons why people with diabetes are more likely to get leg amputations.

Research has shown that diabetics who lower their sugar have healthier "small" blood vessels (microvessels, like in the kidneys and nerves), but the research is less clear on whether or not lowering their sugar will improve their "big" blood vessels (macrovessels, like in the heart and brain). For newly diagnosed type 2 diabetics (typically within two weeks of diagnosis), there's some evidence that intensive sugar control through lifestyle changes and/or medications can heal the macrovessels.

I recommend lifestyle changes for virtually all prediabetics and diabetics. For newly diagnosed diabetics, I offer medication as well, but people who are motivated to make lifestyle changes can sometimes hold off on medication and check their levels again in another three months. However, for patients with very high sugars (e.g., A1C over 9, fasting sugar over 250, any sugar over 300, and/or symptoms), I strongly suggest medications and warn them that it can be dangerous to wait around for another three months with sugars that high.

LOWERING BLOOD SUGAR WITHOUT MEDICATION

First, if you're smoking, then try to stop smoking. There's a lot of evidence that cigarette smoking can accelerate damage to your blood vessels and increase your blood sugar. Talk to your

provider if you're having trouble quitting.

Second, lose weight and exercise. For more details, refer to my chapter on weight, which is where I also discuss healthy diets, glycemic index, and more. It might be challenging to find the right diet for you if you have kidney disease since you might need to watch your protein, carbohydrate, and fat intake very carefully. I can always refer you to a diabetic educator or nutritionist for guidance and meal ideas. On average, people who talk to an educator appear to reduce their A1C by an additional 0.5%.

Third, address any outside factors that might worsen your sugar (like stress). Hopefully, your provider can help you out with this.

Don't be discouraged if you decide to try medication to lower your sugar. As I've mentioned before, it's very difficult to fully reverse diabetes with lifestyle changes alone.

Some supplements have been considered in the treatment of diabetes (cinnamon, fenugreek, green tea extract, resveratrol, etc), but none of them appear to be very effective, and may also have harmful effects. Chromium shows some promise, but both the positives and negatives appear to be very mild or unknown. I talk more about chromium in my chapter on supplements.

LOWERING SUGAR WITH MEDICATION

If you're not diabetic, feel free to skip this section.

The most popular pill for type 2 diabetes is metformin. It's cheap,

doesn't drop your sugar too low, and has moderate effectiveness (lowers A1C by about 1-2%). It's also one of the safest oral diabetic medications during pregnancy. Occasional side effects include diarrhea and nausea, but you can typically avoid these symptoms by taking the extended-release form with food and starting at a low dose to allow your body to adjust. Other side effects include vitamin B12 deficiency (which we can monitor) and potential toxicity when you're very dehydrated, particularly if you're in the hospital.

Some other potentially good options for type 2 diabetes — though maybe more expensive — are SGLT-2 inhibitors (the drug names usually end in "-gliflozin") and GLP-1 agonists (the drug names usually end in "-tide"). The reasons why these options are good are because they can help people lose weight, and they don't drop your blood sugar too low. SGLT-2's are mildly effective at lowering blood sugar (0.5-0.7% decrease in A1C) and GLP-1's are moderately effective (0.5-1.5% decrease in A1C). Most GLP-1's are injections; semaglutide comes in a pill form, but it might not be as effective. There's research showing that these drugs (especially empagliflozin and liraglutide) may increase the lifespan of someone who has type 2 diabetes and heart disease. SGLT-2's may be particularly helpful for mild kidney disease and heart failure. SGLT-2 side effects include increased amputation risk, low bone density, and infections. I discuss GLP-1's and their side effects more in my weight chapter.

I'll run through a few more type 2 diabetes medications. These ones tend to be less desirable than the medications we've discussed already.

Acarbose seems to work better in China than America, mostly

due to differences in diet, like how much rice we eat. Acarbose is usually expensive in America. It decreases A1C by 0.5-0.8%.

DPP-4 inhibitors (the drug names usually end in "-gliptin") are usually expensive and only decrease the A1C by about 0.5-0.8%. They don't pair with GLP-1's well and have other undesirable side effects, such as possibly damaging the pancreas and heart.

Glinides (the drug names usually end with "-glinide") and sulfonylureas (the drug names usually start with "gly-" or "gli-") are two classes of medication that both cause weight gain and might lower your blood sugar too much.

- Glinides, unlike the other diabetic pills, are very short-acting, so they can be taken four times a day (before every meal and before bedtime). Repaglinide appears to be the best glinide.
- Sulfonylureas are usually cheap, so many patients can afford them. Glimepiride has the most evidence supporting its safety, but glipizide is also a good choice for patients.

TZDs/thiazolidinediones (the drug names usually end in "-glitazone") are moderately effective (0.5-1.4% reduction in A1C) and don't usually lower your blood sugar too much, but they may cause harmful effects like fluid retention and bladder cancer. They're banned in certain countries. Pioglitazone might be useful for people who have nonalcoholic fatty liver.

Lastly, let's talk about insulin. This is a big topic, so I'll try to keep things simple. The pancreas is an organ that normally produces insulin throughout the day. It also produces extra insulin after meals to help deal with the extra sugar in the body after you eat.

People with high blood sugar usually have a pancreas that isn't producing enough insulin, so they sometimes need to be prescribed extra insulin to do the pancreas' job.

Insulin is needed for everyone with type 1 diabetes, but it may also be needed for other people with very high sugar. Insulin is very good at lowering blood sugar, but if we accidentally give ourselves too much insulin, we might lower our blood sugar too much, which can lead to fainting and death. Thus, people on insulin need to make sure they have sugar tablets or a quick snack nearby if their blood sugar starts going too low. Glucagon nasal spray may also be helpful to have for emergencies.

There are different forms of insulin. The most common type of insulin is injectable insulin, which is injected into the fatty tissue of the body like in the belly and thighs. There's also inhaled insulin, but it's usually expensive and doesn't work as well as injectable insulin.

There are long-acting insulins, short-acting insulins, and insulins that are somewhere in between. Long-acting insulins are usually given once a day and typically stay in your body for about 24 hours, while short-acting insulins are usually given right before meals and typically stay in your body for 3 to 6 hours. There are also rapid-acting insulins (which act quickly), intermediate-acting insulins (which are sometimes taken twice a day), and mixed insulins (which usually mix intermediate-acting insulin with rapid- or short-acting insulin). Mixed insulins don't allow us to fine-tune the dosage very well, but they might be convenient for patients who want a two-in-one shot.

Some people with diabetes may need to take multiple long-acting

and short-acting insulin injections every day to simulate what a healthy pancreas is supposed to do. This might mean four injections a day (one daily long-acting shot and three mealtime shots)! However, some diabetics may only need one injection of insulin each day.

Each person has a different sensitivity to insulin; heavier people usually need higher doses. When you're new to insulin, it's very important to keep a record of your blood sugars. At the very least, you should check your morning blood sugars (before breakfast) to figure out how much insulin you need. It's also useful to check your sugar at other times, like before every meal and before bedtime. Your insurance might cover a continuous glucose monitor that you can wear by inserting a small needle-like sensor into your skin, which will check your sugar throughout the day without needing to poke your finger multiple times.

A good pre-meal blood sugar goal would be no higher than 130 mg/dL. A good post-meal sugar (2 hours after a meal) would be no higher than 180 mg/dL.

When providers look at your blood sugars and adjust your insulin dose, they are typically trying to bring your sugar down into a good range without dropping your sugar too low. **As patients get older and sicker (like having dementia or a short life expectancy), we become less strict about having a "good blood sugar".** For example, a patient around 30 years old might be recommended to get their A1C under 7.0, but a 90-year-old patient with dementia would probably be OK as long as their A1C is under 8.5. After all, elderly people are more likely to fall, and low blood sugar may cause falls.

Sometimes, patients are told to take extra insulin (usually rapid- or short-acting) if they get a high sugar reading. This is called "sliding scale insulin", since patients usually have instructions to change the dose of extra insulin depending on how high their sugar was. For example, someone with a sugar of 200 mg/dL might be told to give themselves 4 units of insulin, while someone with sugar of 300 mg/dL might be told to give themselves 8 units of insulin. **Sliding scale insulin should only be used as a short-term solution since we should encourage people to eat more predictably instead of scrambling to fix high sugars during the day.** The ideal goal is to find the right amount of insulin to give before meals; this is being proactive!

I won't say much about insulin pumps in this book, since my experience with managing pumps is limited. Pumps are usually managed by endocrinologists for type 1 diabetics.

WE'LL BE COUNTING CARBS

Carbohydrate counting (aka "carb counting") can be a complicated thing to do, so I don't see many people do it, but I'll discuss it here. Carb counting can help you decide if you should give yourself some extra insulin before you eat. Remember, this is a proactive strategy! Carb counting can also be a little helpful for people who AREN'T on insulin since it helps people estimate how much certain foods will raise their blood sugar. I don't recommend carb counting until you have good control over your pre-breakfast sugars first (under 130 mg/dL). If you're ready to continue, then strap in!

You can start your carb counting journey by focusing on one meal per day. For example, let's say your breakfast is a piece of bread and jelly, and your provider told you to give yourself 4 units of lispro (short-acting insulin) before your meal. Look at the nutrition label for your bread. Let's say that a slice has 13 grams of carbohydrates. However, it might also say that a slice has 2 grams of fiber. Since fiber is a carbohydrate that DOESN'T increase your sugar, subtract it from the 13 grams. Now we're at 11 grams of sugar-producing carbs. Similar to fiber, sugar alcohol (which may be found in things like diet sodas and flavored waters) only increases your sugar by about half the amount, so 10 grams of sugar alcohol should equal about 5 grams of sugar-producing carbs. Now let's say that a tablespoon of your jelly has 13 grams of carbohydrates. So if you have a slice of bread and a tablespoon of jelly, then your total amount of sugar-producing carbohydrates is 13 grams (bread) minus 2 grams (fiber) plus 13 grams (jelly), which equals 24 grams.

Eat your breakfast, then check your sugar in about 2 or 3 hours. If your sugar is high at that time (>180 mg/dL), then you probably need to eat fewer carbohydrates during breakfast or increase your breakfast lispro, which can be discussed with your provider. However, if your sugar is still good at that time, then you can guess that 4 units of lispro can cover about 24 grams of carbohydrates around breakfast time. Therefore, 1 unit of lispro should cover about 6 grams of carbohydrates. This 1-to-6 ratio is considered your breakfast insulin sensitivity and will allow you to adjust your insulin proactively for future breakfasts. For example, if you know that tomorrow you'll have TWO slices of bread and TWO tablespoons of jelly (48 grams of carbohydrates), then you can give yourself 8 units of lispro before breakfast (since 48 divided by 6 equals 8).

Since your insulin sensitivity may be different during different times of the day, try to determine your lunch insulin sensitivity and dinner insulin sensitivity next! Your blood sugar might also fluctuate when you're sick or stressed out. So even though I calculated the breakfast insulin sensitivity after just one day in my example, it would be better to do this for several days or weeks to get a more accurate estimate.

Again, carb counting and insulin sensitivity take a lot of work to calculate! It might be tricky to count carbs at restaurants since you might not know the nutritional information for everything on the menu. However, with practice, you should become faster and better at it!

CHAPTER EIGHT

High Blood Pressure

THROUGH THE ROOF

What's the definition of a high blood pressure (hypertension)? It depends on who you ask and how healthy the patient is.

There are two major sets of guidelines for managing blood pressure (BP). The first set of guidelines was developed by the JNC-8 (a committee of different professionals), while the second set of guidelines comes from the American Heart Association and the American College of Cardiology. These two sets have similarities and differences.

They both agree that a normal blood pressure is under 120/80 mmHg. The first number (in this example, 120) is the systolic blood pressure, which is how high your blood pressure is when your heart muscles squeeze. The second number is the diastolic blood pressure, which is how high your blood pressure is when your heart muscles relax.

So if your systolic pressure is at least 120 mmHg or your diastolic pressure is at least 80 mmHg, then this may be a sign of high blood pressure. **However, most people have higher blood pressures in doctors' offices.** This phenomenon is called "white

coat hypertension". White coat hypertension usually does NOT need to be treated. This is why we usually recommend checking your blood pressure **at home** (when relaxed) before we diagnose you with hypertension. However, if a patient has a SEVERELY high blood pressure (over 180/120 mmHg) in the office or seems to be experiencing symptoms of high blood pressure (which we'll discuss later), it would be reasonable to start blood pressure medication without waiting for the patient to check their blood pressure at home. If a patient can't afford to buy their own BP cuff, then at least three high blood pressures in the office over several weeks to months can make a diagnosis.

These two sets of guidelines disagree with each other on WHEN to start treating blood pressure.

JNC-8 recommends treating patients who have a blood pressure of at least 140/90 mmHg if they're younger than 60 years old. For patients who are older than 60 years old (and don't have diabetes or chronic kidney disease), then a blood pressure of under 150/90 mmHg is good enough. **Age and medical conditions matter because older people tend to fall more easily, so lowering their blood pressure too much may cause them to get lightheaded and fall;** diseases like diabetes and kidney disease might increase your risk of having heart attacks and strokes (which are also associated with high blood pressure), so it's important to keep the blood pressure lower.

On the other hand, the AHA/ACC guidelines recommend treating patients who have a blood pressure of at least 130/80 mmHg if they have cardiovascular disease risks. They don't have specific recommendations for age. This is a stricter recommendation than the JNC-8's. However, they believe that a patient at low risk for

cardiovascular events (e.g., heart attacks and strokes) would be fine at a blood pressure under 140/90.

Due to disagreement over which set of guidelines is better, I like to make patients aware of both sets. I like to discuss ways to lower their blood pressure without using medications, and I like to ask about their thoughts on starting medications. Some patients who have a family history of cardiovascular events may be more eager to get their blood pressure into a lower range.

MEASURING BLOOD PRESSURE

Measuring your blood pressure is a little more complicated than you may think.

1. Your back should be straight.
2. Your feet should be flat on the floor.
3. You shouldn't have the urge to urinate.
4. You should avoid nicotine or smoking for at least 1 hour prior.
5. Coffee might increase your blood pressure for several hours after consumption, but this is probably less impactful in people who drink coffee every day.
6. The cuff should be wrapped around bare skin, not around clothes.
7. Your hand should be relaxed.
8. The arm with the cuff on it should be supported so that the middle of the cuff is level with the middle of your chest.
9. The cuff bladder (the part that puffs up) should be big enough to wrap around at least 80% of your arm.

10. You shouldn't talk while taking a measurement.
11. You should relax for at least five minutes prior.
12. If you're going to check your blood pressure multiple times, wait for at least 1 minute between checks.

Got all that?

The two most common ways of measuring blood pressure are automatic cuffs and human-operated (manual) cuffs. One method isn't always more accurate than the other. The accuracy of the manual cuff can depend on the technique of the person using it. An automatic cuff may have accuracy issues as well, which is why I typically recommend that patients bring in their cuff to see how close their readings are to our office's readings. Generally, if the cuffs are within 10 points of each other, then they're giving similar readings. I've had some patients tell me that their blood pressure is often higher on an automatic cuff than a manual cuff, which may be due to multiple reasons.

Blood pressure cuffs that are marketed to be worn on the wrist or finger are less accurate than arm cuffs, so I typically don't recommend them.

There are websites such as ValidateBP.org that list some good blood pressure cuffs.

There's also a device called an Ambulatory Blood Pressure Monitor (ABPM) that you can wear for 24 hours, and it will check your blood pressure automatically about every 15 to 60 minutes. Even though this device gives us a lot of information about a person's blood pressure, I've never seen anyone wear it; I guess there's a lack of insurance coverage (which fortunately seems to

be improving), and the cost required by offices and patients to set these devices up is probably an obstacle.

I generally recommend that patients with a new diagnosis of high blood pressure or a suspected diagnosis check their blood pressure once or twice a day — once in the morning and once in the evening. **I recommend that they do this for a week before showing me their pressure readings**. This gives me a good assessment of their blood pressure trends from morning (when blood pressure is usually highest) to night (when blood pressure is usually lowest). Once a person's blood pressure is more stable, they don't need to check as frequently — perhaps once a week or once a month. If a blood pressure reading is a lot lower or higher than usual, I recommend rechecking it a couple more times to confirm the reading.

It's OK for blood pressure to be a little different between the left and right arm. Some normal reasons for a pressure difference between arms could be a change in stress levels after measuring one arm or a change in cuff position when you switch arms. However, if the difference between arm pressures is more than 15 mmHg, then this may mean that blood is not flowing correctly through one of your arms, which could be a sign of diseased arteries.

Some people have blood pressures where their diastolic blood pressure is very close to their systolic pressure (diastolic at 75% of systolic or higher). This is sometimes caused by stiffness from aging and high cardiac output. Other people have blood pressures where the diastolic pressure is a lot lower than the systolic (100 mmHg lower). This is sometimes seen in low cardiac output, like in heart failure. There's ongoing research which

suggests that people with a large difference between systolic and diastolic pressures are at higher risk for heart disease, but this information hasn't really changed how we treat blood pressure.

LOWERING BLOOD PRESSURE WITHOUT MEDICATION

It's important to lower your blood pressure. The scariest blood pressure problems are probably strokes and heart attacks. Kidney disease might also happen. In most cases, people with mildly high BP won't have any symptoms. However, when hypertension becomes severe (especially >180/120), more people start to notice symptoms, like feeling strange, headaches, weakness, nausea, vision changes, chest pain, shortness of breath, and ripping back pain. These symptoms may be medical emergencies.

Many factors cause high blood pressure:

- I already mentioned a few above, such as smoking, coffee, stress, and getting older.
- Being overweight.
- Poor sleep quality (especially sleep apnea).
- Stress. We might recommend getting set up with a counselor or starting medications if your anxiety is significant.
- Genetics. Hypertension runs in families and is more common in Black people.

Let's talk about some factors in more detail. Typically, making changes in weight, diet, sodium, potassium, exercise, or alcohol can lower your systolic BP by 4 to 10 mm Hg, and lower your diastolic BP by a bit as well. Some of these changes may have an

additive effect, meaning that making two changes may lower your blood pressure by twice as much as making one change.

A high sodium diet can increase blood pressure, sometimes by over 10 mmHg of systolic. **Very salt-sensitive people include the elderly, Black people, and… people who have hypertension!** Look at the back of nutrition labels and try to have less than 2000 mg of sodium per day. Frozen and canned foods may be especially high in sodium. Replacing salt with salt-free seasonings and spices might be a good idea. A nice bonus with using potassium-based seasonings is that potassium supplementation may help lower your blood pressure. However, if you have kidney disease, then be careful about potassium-based seasonings or foods high in potassium, since they may raise your potassium too much. I would also recommend discussing potassium supplements (up to 120 mEq daily between diet and supplements) with your provider before attempting to supplement on your own. Fortunately, once you cut out extra sodium from your diet, your taste buds may end up getting used to less salty foods!

Moderate alcohol consumption (no more than two drinks for men and one drink for women per day) may be good for the heart, but the research isn't strong enough for providers to recommend that non-drinkers start drinking. It's unclear if wine is better than other types of alcohol for your heart and blood pressure. It's also important to avoid drinking more than a moderate amount of alcohol since drinking too much might increase your blood pressure.

Smoking tobacco (and probably e-cigarettes and hookah) increases blood pressure by about 20 mmHg for about 30

minutes. Interestingly, some smokers have better blood pressures than non-smokers, since smokers are generally thinner than non-smokers. However, smoking is a terrible idea for lowering blood pressure, since it causes arteries to stiffen up. Artery damage can last for years, even after quitting smoking. Additionally, if you're smoking a cigarette every 15 to 30 minutes, then you're likely keeping your blood pressure high during a lot of the day.

A sedentary lifestyle can increase blood pressure, so exercise is a good way to fix this. You should shoot for at least 150 minutes of moderate exercise or 75 minutes of vigorous exercise each week. Refer to my chapter about weight for more guidance on exercise. Aerobic exercise seems to be more helpful than strength training for hypertension, but any type of exercise is better than no exercise.

Caffeine can be found in coffee, tea, soda, chocolate, and more. Again, coffee seems to increase blood pressure (by at least 5 to 20 mmHg) for several hours after drinking, but daily coffee drinkers don't seem to be affected by coffee as much. Regardless, if you're a daily coffee drinker, then cutting back on coffee may lower your blood pressure. Interestingly, a study showed that giving coffee to a daily coffee drinker didn't affect their blood pressure, but giving IV caffeine to a daily drinker DID increase their blood pressure, suggesting that even daily drinkers aren't immune to the BP-raising effects of caffeine, and that there may be other properties of coffee (besides caffeine) that increase blood pressure.

Some medications may cause high blood pressure, like estrogen, steroids, decongestants, stimulants (by about 5 to 6 mmHg in ADHD), and more. Non-steroidal anti-inflammatories like ibuprofen may increase BP by 3-5 mmHg, but baby aspirin

doesn't seem to do this. Long-term oral acetaminophen (i.e. weeks of Tylenol) may increase blood pressure slightly as well, though we're not sure if this causes any harm.

Certain medical conditions can cause high blood pressure. I mentioned sleep apnea above. Signs of sleep apnea include loud snoring, breath-holding while sleeping, and tiredness after waking. Having imbalanced hormones and kidney disease can increase blood pressure as well; these can be tested easily through the blood, but the rarer medical conditions aren't often tested unless someone has strange symptoms or very severe hypertension. We're also more likely to check for rarer conditions if someone is young or on multiple BP medications.

In addition to a low sodium diet, there are other diets that may be helpful for blood pressure. These include the DASH diet (which stands for "Dietary Approach to Stopping Hypertension") and a lacto-ovo vegetarian diet (where dairy, eggs, and vegetables are OK to eat, but not meat). The DASH diet is similar to other healthy diets that I describe in my weight chapter; it recommends fruit, vegetables, whole grains (e.g., brown rice and whole grains), nuts, seeds, legumes, low-fat dairy products, lean meats (e.g., poultry and fish), and limiting saturated fats and high-sugar products.

In addition to the potassium supplements I described earlier, there are possibly other supplements that can lower your blood pressure by a little, but potassium looks to be the most effective and may reduce your risk of stroke when taken in safe amounts. Weak evidence supports magnesium, fish oil, high fiber, folate, and polyphenol-rich foods. These may reduce blood pressure by between 1 to 5 mmHg, but they're not typically recommended.

However, if you're interested, here are some recommendations on how to take them:

- Magnesium and folate should ideally be taken under the supervision of a provider who can check your levels.
- Fish oil appears to be safe, though the health benefits seem more significant at higher doses (at least 3 to 4 grams). Unfortunately, these high doses may cause nausea and bad breath!
- Try to find polyphenols in foods that don't have a lot of sugar. Dark chocolate, blackberries, kale, broccoli, and red wine are some good options for polyphenols.

LOWERING BLOOD PRESSURE WITH MEDICATION

Deciding when to start blood pressure medication is a little complicated, but it usually boils down to how high a patient's BP is and how confident they are about making lifestyle changes.

Like with other medications, patients often ask me if starting a BP medication will cause them to be "stuck" on medication forever. This is mostly false, since many things that cause high blood pressure are reversible WITHOUT medication, so medication might only need to be taken temporarily. However, there IS some truth to the concern of getting "stuck". This is because blood pressure naturally goes up with age, so it becomes harder to have a "good" BP as you get older. **Somewhat fortunately, our definition of a "good blood pressure" becomes less strict as we get older.**

There are three primary families of BP medications that I start with. They often lower your blood pressure by up to 20/10

mmHg, though some people may be less sensitive to one family and should try another family. Typically, higher doses of medications have diminishing returns, so if you double the dose of a medication, you might not lower your blood pressure by double the amount. If only it was that simple!

The first family, the dihydropyridine calcium-channel blockers, includes amlodipine. Dihydropyridines are different from non-dihydropyridines (like verapamil), which are more often used for slowing down the heart than for lowering BP. **If hypertension is the only problem that a patient has, I typically start with a dihydropyridine,** since dihydropyridines don't have too many side effects. For example, they don't affect your body's electrolytes like some of the other medications do, so there's no pressure to recheck blood tests within two weeks after starting, stopping, or adjusting the dose. An interesting side effect that's seen in about 2 to 11% of patients on amlodipine is leg swelling. These medications relax your blood vessels, so they might help migraines and Raynaud phenomenon, which is a condition where your fingers might painfully change color when you're cold or stressed.

The second family of medications is the angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs). Although these are two different groups of medications, their properties are very similar, so they should NOT be taken together. I have a slight preference for ARBs (like losartan) due to the potential side effects of ACE inhibitors, such as life-threatening swelling and a dry cough. Losartan might not be as powerful as some other ARBs, but it's very cheap and seems to reduce the risk of gout. Some drawbacks to this family are its lack of effectiveness for Black people and its tendency to raise potassium levels, so blood levels should be monitored. They also

aren't safe during pregnancy. Some positives to this family are its beneficial effects on certain heart and kidney diseases, although it can aggravate the kidneys as well.

The third and final family of first-line medications is the thiazide diuretics. A diURetic is something that increases URination, so you might have to plan bathroom trips if you start these medications. Because of the urination effect, this family help get rid of swelling. A common thiazide is hydrochlorothiazide. There's a stronger thiazide called chlorthalidone, but it has worse side effects. Side effects for this family include low potassium, low sodium, high blood sugar, and gout. Because this family can cause sensitivity to sunlight, sunscreen is recommended. It should be avoided in people with closed-angle glaucoma. However, it can be helpful for people with low bone density or kidney stones, since it prevents calcium from going into your kidneys and exiting your body through your urine.

What happens if one family of medication doesn't seem to lower your blood pressure enough? Usually, I increase the dose. Sometimes, I add another medication or switch to another medication. It depends on a lot of things! **It's important to keep in mind that it might take several days or weeks to really see the full effects of blood pressure medication, so give it some time.**

If we're thinking about combining medications to lower blood pressure more, a dihydropyridine calcium channel blocker pairs better with an ACE inhibitor/ARB than a thiazide (in nonobese patients). Thiazides also appear to enhance the effectiveness of ACE inhibitors/ARBs.

Other medications can be used to lower blood pressure, but they

might be less effective or have worse side effects:

- Beta-blockers (like metoprolol and propranolol) are pretty common medications because they have multiple uses, such as treating heart disease, performance anxiety, tremors, migraines, and more. Unfortunately, they don't pair very well with ACE inhibitors/ARBs and may also increase your blood sugar, weight, and fatigue. They also do a poor job of preventing strokes, and not all of them are safe during pregnancy.
- Loop diuretics (like furosemide) are often used to aggressively reduce swelling, especially in patients with heart failure. Unfortunately, they don't lower blood pressure as well as thiazide diuretics and share similar side effects.
- You may also have heard of medications like hydralazine and clonidine, which are usually only used as a last resort due to multiple reasons.

Many blood pressure medications only need to be taken once a day, but it's possible that taking them twice a day might be helpful for people with higher pressures around bedtime. Longer-acting blood pressure medications (like amlodipine and losartan) probably DON'T need to be taken twice a day. There isn't agreement over whether taking BP meds at night is better than taking BP meds in the morning, but consider taking diuretics like hydrochlorothiazide in the morning to avoid having to wake up at night to urinate.

Hypertension is a very common problem, so you aren't alone in this!

CHAPTER NINE

High Cholesterol and Fat

WHAT'S THE DEAL WITH LIPIDS?

When we check your blood for cholesterol and fat, we often order a whole lipid panel, which tests for different types of cholesterol and triglycerides (a type of fat). As a patient, looking at your lipid results is probably confusing, so let me try to simplify it. I've had issues with my own cholesterol levels, so this is an area of interest for me.

Generally, we focus on four types of lipids: the high-density lipoprotein (HDL), the low-density lipoprotein (LDL), the total cholesterol, and the triglycerides. With these numbers, we can estimate your risk of atherosclerotic cardiovascular disease (ASCVD) and more. ASCVD refers to heart and artery disease that involves plaque buildup, like in the heart, extremities, brain, and aorta.

HDL levels seem to be associated with a decreased risk of ASCVD, so having a low level is bad. HDL is sometimes known as "the good cholesterol".

LDL and triglyceride levels are associated with an increased risk of ASCVD, so having high levels is bad. However, even though

having a high triglyceride is probably bad, the evidence supporting this theory isn't as strong as the evidence about HDL and LDL. At the very least, very high triglyceride levels may cause inflammation in the pancreas.

Strangely, increasing HDL through medications or supplements (like vitamin B3) doesn't seem to improve your health, so we don't recommend doing that. Instead, healthy lifestyle habits might increase HDL AND improve your health, so we recommend exercise, healthy eating, getting a healthy weight, and quitting smoking.

The most common cause of a low or high HDL is genetic, so you might want to blame your parents! Some medications may also decrease HDL (like beta blockers and benzodiazepines), but we don't recommend stopping them if you need them. Inflammation may also decrease HDL.

Interestingly, high HDL levels may be found in people with low thyroid hormone, insulin treatment (particularly in type 1 diabetics), and alcohol abuse, so having a high HDL isn't ALWAYS a sign that you're in good health. Some people with high HDL levels have dysfunctional HDL particles, which can worsen ASCVD.

Similarly, your triglyceride and LDL levels are ALSO affected by genetics and factors like thyroid problems, obesity, alcohol abuse, inflammation, and medications (like beta blockers and thiazides).

RISKY BUSINESS

There are different ways to determine your risk of developing ASCVD. Since we want enough HDL cholesterol to counteract our non-HDL cholesterol, we like our total cholesterol level to be no more than five times higher than our HDL level. Additionally, an LDL level below 100 mg/dL is ideal, and an LDL level above 190 mg/dL is concerning. Since total cholesterol levels can vary by about 5 to 10 percent from day to day, a repeat test should probably be ordered for someone who is borderline. Triglyceride levels also tend to vary, so should be rechecked as well.

Is it possible to have an LDL level that is TOO LOW? Sort of! If your LDL is low because you're on cholesterol medication, it's probably nothing to worry about. However, if you were born with a low LDL (usually under 50 mg/dL), then you might have a genetic problem, but this isn't my area of expertise. Lastly, some illnesses can lower your LDL, so treating the illness might bring your LDL back up.

There are also math equations that can determine your risk of disease. A popular one that doctors use is the ASCVD risk score math formula developed by the American College of Cardiology and American Heart Association (ACC/AHA) that you can find online. It considers your lipid numbers, age, gender, race, smoking status, blood pressure, and more.

- Generally, a 10-year ASCVD risk score of under 5% is good — this means that there is a less than 5% chance that you'll have a heart attack or stroke within the next 10 years.
- A score of over 20% is very high, so you need to be careful about your health.
- A score between 5% and 20% is somewhere in between.

Generally, a score above 7.5% or 10% would be concerning.

- A 30-year (or lifetime) ASCVD risk score can also be calculated, but the evidence behind using a lifetime score is a little weak. A lifetime score of 40% or higher would be concerning.

The 10-year risk score isn't perfect. It might underestimate risk in some races (e.g., American Indians, South Asians, and Puerto Ricans) and overestimate risk in other races (e.g., East Asians and Mexican Americans). The score is also heavily influenced by age, so it's possible for a person between 65 and 75 years old to have a high score without any diabetes, high blood pressure, smoking, or high cholesterol! It's tough to say if treatment would help these patients very much.

We're still doing a lot of research into the science behind cholesterol and ASCVD. There are more detailed cholesterol tests that tell us the size of your cholesterol particles, lipoprotein A, and more. These are usually more expensive to test, and we don't need to order these for everyone. People who might want these more expensive tests include healthy people who have a first-degree relative who had a premature cardiovascular attack ("premature" usually means a man who had an event before age 55 or a woman who had an event before age 65), people with very high LDL (over 190), or people who'd like to know more about their cholesterol before making big lifestyle changes. I could also refer you to a lipid expert if you'd like.

Ideally, you should be fasting for at least 8 hours before getting a cholesterol test. Drinking water before your test is fine. We recommend fasting, since recent food or drink may increase your

triglyceride levels, which may falsely lower your LDL. However, as long as your triglyceride level is under 400 mg/dL, it's reasonable to check a lipid panel if you don't have time to come in again for a fasting test. Our lab will run a separate "direct" LDL test anyway if the triglyceride level comes back too high.

NON-MEDICATION OPTIONS

I talk about healthy diets and exercise in my chapter about weight, but I'll go over some things again:

- Try a Mediterranean diet, DASH diet, vegetarian diet, or low-carbohydrate diet.
- Limit trans fats and saturated fats.
- **Dietary cholesterol doesn't really increase your cholesterol levels, but many foods that are high in cholesterol may also be high in unhealthy fats that DO increase your cholesterol.**
- Increase intake of soy, fiber, and nuts.
- Foods rich in polyphenols (dark chocolate, blackberries, kale, broccoli, red wine, etc.) appear to be helpful, but tea has mixed evidence, and artificially supplementing with plant sterols/stanols and polyphenols like resveratrol doesn't appear to have the same health benefits, and may even worsen things!
- 150 minutes of moderate exercise or 75 minutes of vigorous exercise per week is recommended for increasing HDL and lowering triglycerides and LDL, but any amount of exercise is better than no exercise.
- High-intensity interval training (HIIT), which involves intense periods of exercise with breaks in between, may be especially good for the heart.

- **Making healthy changes may improve your lipid levels within weeks, but it usually takes at least three months.**

Let's move on to supplements!

Omega-3 fatty acids (which are found naturally in flaxseed, chia seeds, soybean oil, canola oil, some nuts, fatty fish, and fish oil) appear to reduce triglycerides, but may strangely increase LDL. This might be due to an increase in large LDL particles, which aren't as dangerous as small LDL particles. The specific type of omega-3 that you want is probably eicosapentaenoic acid (EPA), which appears to be more effective than docosahexaenoic acid (DHA) in the lipid department. Icosapent ethyl is a prescription EPA that's used to treat high triglycerides; it usually shows good results within two weeks of starting. Generally, people with a triglyceride level between 150 to 500 mg/dL don't need to take medication unless they have ASCVD. However, people with diabetes plus two additional ASCVD risk factors (like age 50+, smoking, high blood pressure, and low HDL) may benefit from icosapent ethyl.

Red yeast rice is a supplement that can lower LDL. **It contains a substance that's identical to a medication called lovastatin.** Lovastatin is FDA-regulated for quality control, so I prefer it over red yeast rice. Red yeast rice appears to be safe to take for up to four months, but we're not sure beyond that.

Berberine is a supplement that appears to reduce LDL. The doses studied were generally between 600 to 1,500 mg per day. It appears to be safe to take for up to six months, but we're not sure beyond that.

Probiotics may reduce LDL, but the research has been weak so far.

Coconut oil, coconut water, and garlic don't seem to be very helpful.

MEDICATION OPTIONS

If lifestyle changes don't lower your lipids enough, then a lipid-lowering medication might help. There are differences between medications that treat triglycerides and medications that treat cholesterol.

The recommendations for treating high triglycerides are a little easier to explain, so I'll start there. I already discussed what to do with people who have a level between 150 to 500 mg/dL. For people with a level ABOVE 500 mg/dL, we suggest starting fibrate medications to reduce the risk of ASCVD and inflammation in the pancreas. However, the benefits of starting a fibrate for triglycerides below 1000 mg/dL aren't strongly supported. Fortunately, I rarely see people with triglyceride levels higher than 500 mg/dL.

Fibrate medications (like fenofibrate) generally reduce triglycerides by about 50% and increase HDL by 5 to 20%. It might increase LDL levels and LDL size, but this is probably NOT dangerous as I mentioned before. The main side effects of fibrates are kidney and liver stress, so your kidney and liver health should be monitored through blood tests. Maximal improvements in lipids are seen after two months of taking fibrates. Mild elevations in liver enzymes are reversible once the

medication is stopped. Severe liver injury is rare and usually only occurs when people keep taking fibrates without monitoring their liver levels. Muscle cramps and weakness happen in about 3% of people. Severe muscle injury is even rarer, but it's more likely to happen if you take fibrates and statin medications together, bringing the risk from about 0.1% to up to 2.5%.

Now let's move on to cholesterol medications.

Healthy people younger than 20 years old or older than 75 years old usually aren't recommended to start cholesterol medications like statins, since we're not sure if they'll get any benefit out of it.

There's also not much research about using cholesterol medications in people between the ages of 20 and 40. In this age range, we usually only recommend cholesterol medications for people with an LDL above 190. Even though the AHA/ACC's ASCVD calculator was only tested in people between the ages of 40 and 75, you can round your age up or down to get a very rough estimate of your risk. If your 10-year ASCVD risk is over 10% with an LDL over 100 mg/dL, that's somewhat concerning, but overall I would NOT strongly recommend that most people under 40 or over 75 years old start a cholesterol medication.

For people who are in the "evidence sweet spot" age range of 40 to 75 years old, there's stronger evidence for the benefits of statins (like atorvastatin). Again, people with an LDL above 100 mg/dL and over a 7.5 to 10% 10-year ASCVD risk are good candidates for starting a statin. Some providers would argue that people under 10% risk don't really need to be on a statin, so a provider should discuss the pros and cons of statins with these people and perhaps calculate their lifetime ASCVD risk scores.

Also, people in this age range who have diabetes should probably be on a statin REGARDLESS of their risk score, since diabetes can accelerate plaque buildup in the arteries.

For people who ALREADY have ASCVD or a risk score over 20%, cholesterol medication is even more important. Some of these patients have already seen a cardiologist or neurologist due to a heart attack or stroke, so they may already be on a high-dose statin and aspirin. These people should try to keep their LDL below 70 mg/dL, compared to a softly suggested LDL of 100 mg/dL for healthier people.

Statins usually reduce the risk for ASCVD events (especially heart attacks) by about 20 to 30 percent. Atorvastatin and rosuvastatin are the strongest statins. Rosuvastatin is especially powerful in East Asians. People with a high ASCVD risk (>20%) should take a high dose, while most other people should take a moderate dose. You generally do NOT need to start with a low dose first. A lipid test should be checked around two months after starting a statin to make sure that we're seeing some improvement in the levels. LDL should drop by at least 25%, triglycerides may drop a little, and HDL may increase a little. Increasing the statin dose is usually unnecessary since research doesn't show much benefit in doing this. However, increasing the dose may be considered to get someone's LDL below 100 mg/dL if we're really trying to lower their cholesterol.

Statins seem to bring a lot of benefits, but they come with some negatives as well. Like fibrates, statins may cause muscle cramps and weakness in 2 to 11 percent of people, but severe muscle damage is rare (<0.1%). These muscle issues usually are reversible and show themselves within the first few months of starting a

statin. For people who develop muscle issues, we recommend checking their thyroid and vitamin D levels, since deficiencies in these may be responsible for their symptoms. Certain statins are gentler on the muscles, but can't lower LDL as much, like pravastatin, pitavastatin, and fluvastatin. Some studies suggest taking coenzyme Q10 (CoQ10) to prevent muscle cramps when taking statins, but the evidence is pretty weak. CoQ10 doesn't seem to be dangerous, but it might decrease the effectiveness of warfarin, which is a blood thinner.

With statins, severe liver injury is incredibly rare. It's so rare that people NOT ON statins have about the same chance of getting liver failure as people ON statins. As long as someone's liver levels look good before starting a statin, it's not necessary to recheck the liver enzymes quickly — waiting until next year is very reasonable. Pravastatin and probably rosuvastatin are safer in (stable) liver disease.

Effects on the kidneys include protein in the urine (probably harmless) and rare kidney injury. Statins may extend the lives of many people who have kidney disease and ASCVD risks. Atorvastatin and fluvastatin don't require any dose adjustments in kidney disease.

Concerns have been raised in the media about memory issues with statins, but the evidence is conflicting. Some studies have shown more memory issues, but some have shown no effect on memory. In fact, some studies have shown that statins can PREVENT dementia, probably by preventing cholesterol buildup in the brain. Regardless, if a patient starts noticing memory issues after starting a statin, then it might be worth stopping it or switching to a statin like pravastatin or rosuvastatin.

Statins may also increase blood sugar slightly, but for the majority of people that we recommend statins for, the ASCVD-reducing benefits of statins likely outweigh this negative.

Statins don't seem to have a significant effect (positive or negative) on cancers, cataracts, nerve issues, hormones, and the immune system, so we don't usually factor these into our decision-making.

OTHER MEDICATIONS

Although aspirin technically isn't a lipid-reducing medication, it's a blood thinner that may reduce ASCVD. It may also reduce the risk of colon cancer if you take aspirin for over 10 years. People with certain conditions (like heart attacks and strokes) may benefit from taking lifelong aspirin to reduce the risk of having more episodes and attacks. However, the benefits of aspirin in HEALTHIER people are less clear. In fact, we don't recommend aspirin for healthy people who are over 60 to 70 years old and have low ASCVD risk, since aspirin may cause bleeding, and this isn't outweighed by any of its benefits. However, for people between the ages of 40 to 59 with a 10% or higher 10-year ASCVD risk score, aspirin may be a good option. 81 mg appears to be a good dose for most people; higher doses may be excessive.

Colchicine is an anti-inflammatory medication that can be used for people with chronic coronary artery disease. It should only be used in people with healthy kidneys and a healthy liver. I have limited experience with prescribing colchicine for the heart, but I

sometimes use it to treat gout!

For anyone who needs another medication to lower their LDL, ezetimibe may be a good choice. Like statins, it seems to lower LDL cholesterol and has similar side effects involving the liver and muscles, but it doesn't work as well as statins do.

Lastly, PCSK9 inhibitors are new-ish medications that lower LDL and decrease ASCVD. However, they're expensive and need to be injected every two to four weeks. Like ezetimibe, PCSK9 inhibitors are used for people with ASCVD who need another medication to lower their LDL. The biggest side effect is probably irritation at the injection site. I rarely run into opportunities to prescribe these medications, but it's cool that these medications exist!

The science behind lipids is interesting, and I hope you understand it better!

CHAPTER TEN

Mood Issues

MOOD MAGIC

I commonly see patients with different mood issues, like depression and anxiety. Unfortunately, due to mental health stigma, some patients are hesitant to discuss their concerns with other people. I'd like to fight against the misconception that mental health problems are something to be ashamed of.

About 18 percent of people in the United States have medically diagnosable depression, and many people will experience significant depression by the time they turn 30 years old. There also seems to be a hereditary component to mood disorders, which we've seen in studies of identical twins versus fraternal twins and studies of adoptive parents versus biological parents. About twice as many women as men suffer from depression, which might be explained by factors such as hormones.

Interestingly, there seem to be anatomical differences between patients with and without mood issues. For example, people with depression appear to have less gray matter in certain areas of their brains (like the hippocampus). However, it's unclear if these differences cause depression, result from depression, or are simply coincidental.

I will primarily focus on depression, anxiety, and panic since these are the issues that I have the most experience with. Attention-deficit and hyperactivity disorder (ADHD) is also an area of interest for me that I'll touch upon.

First, I'd like to point out that not every mental health complaint is a mental disorder. For example, being depressed every once in a while doesn't mean that you have a depressive disorder. Depression as a mood state (i.e. "depressed mood") can be a normal response to stress, and it can often improve without the help of a medical professional. However, major depressive DISORDER is a medical diagnosis that's more likely to benefit from medical care.

The most widely used rules for diagnosing mental health disorders come from the American Psychiatric Association and their book, the Diagnostic and Statistical Manual (DSM). One important distinction between disorders and "normal" mood issues is that many disorders are required to be severe enough to cause significant distress or interfere with usual activities.

As an example, here are the current DSM criteria for major depressive disorder:

1. At least 5 new symptoms are present during a two-week period for nearly every day (though 'f' only needs to happen once), and at least one symptom must be either 'a' or 'b':
    a. Depressed mood for most of the day
    b. Loss of interest or pleasure in most activities
    c. Too much or too little sleep

   d. Significant weight change or appetite change
   e. Changes in the speed of thinking and movement that are noticed by others
   f. Fatigue
   g. Difficulty thinking or concentrating
   h. Feeling worthless or excessively guilty
   i. Thoughts of death or suicide
2. The symptoms cause significant distress or affect social, occupational, or other areas of functioning.
3. The symptoms are not a result of a substance or another medical condition.
4. There was never a manic or hypomanic episode.

There are rules like this for diagnosing all sorts of things, like persistent depressive disorder and bipolar disorder. Although every individual is different, it's useful to have basic diagnostic rules. This allows us to have a shared knowledge base to learn and build on, which is useful for predicting treatment effects and more.

One of the difficult things about diagnosing mental health disorders is the large amount of overlap among other health problems. For example, both ADHD and major depressive disorder are associated with difficulty concentrating, and someone who has an underactive thyroid may share many symptoms with someone who has depression. This is why it's good to make sure that there aren't other explanations for why someone is having a mental health problem. It's important to hear a good story from the patient. I also like to check blood tests like a thyroid test. Fortunately, there aren't too many medications that cause mood disorders: sedatives, stimulants, montelukast, steroids, beta blockers, famotidine, and cimetidine

are some culprits. If a patient thinks that a medication is affecting their mood, then I like to discuss the possibility of stopping the medication or switching to an alternative.

A fascinating thing about the human body is its ability to turn stress into symptoms. Some good examples of this include panic disorder, irritable bowel syndrome, fibromyalgia, and somatic symptom disorder. For example, panic attacks may cause at least 13 different symptoms, according to the DSM: heart racing, sweating, shaking, shortness of breath, choking, chest pain, nausea, dizziness, temperature changes, numbness and tingling, derealization, a fear of losing control, and a fear of dying. Therefore, it might be hard to tell if stress is causing symptoms (like chest pain), or if there's another medical problem happening. Treatment options for many of these stressful conditions include antidepressants.

TREATMENT WITHOUT MEDICATIONS

Before we talk about medications, let me put the spotlight on psychotherapy. I sometimes refer to this as talk therapy or counseling.

To me, talk therapy is similar to physical therapy. Both are basically "natural" treatments that continue to benefit you even after you stop going to therapy. The biggest drawbacks are the initial investment of time and money.

Of course, talk therapy isn't a miracle cure. You might need to speak with different therapists before you find one that you have chemistry with. Also, therapy isn't just sitting back and listening

to someone talk to you — you have to put in work too. It's like a mental workout! It generally takes weeks or months to achieve any noticeable improvement, but the same can be said about medication! Alternatively, if you aren't able to find a talk therapist, you can try doing therapeutic activities by yourself, like meditation, relaxation, and exercise.

For people with mild mood issues, I usually do NOT suggest medications first. However, severe mood issues and disorders may require starting a combination of non-medication treatments and medications.

There are different types of talk therapy. I'm not familiar with all of them, but a popular one is cognitive behavioral therapy (CBT). The basic principle of CBT is to recognize what illogical thoughts (cognitive distortions) your brain tells itself and how to behave positively when these thoughts are in your head. Cognitive distortions are very interesting; you can read more about them online! For example, do you know about catastrophizing and minimizing?

Some other potential ways to improve depression and anxiety include more alternative and complementary therapies. I have mixed thoughts about these therapies, and you can read more about my feelings in the supplements chapter. In that chapter, I also talk about vitamins, which generally won't fix mood issues in people who have normal vitamin levels. You should ideally get nutrients from natural food sources rather than from supplements, though supplements like magnesium and vitamins A, B6, B9, B12, C, D, and E have apparently sparked interest in the field of mental health.

In brief, I think that alternative therapies are fine to take, as long as the therapies aren't harmful or delaying better treatments for too long. Alternative therapies often aren't as effective as we'd like them to be, but they can be good when added on to standard therapies.

The following recommendations apply to **healthy non-pregnant adults**.

These seem safe and potentially effective:

- **Bright light therapy (phototherapy)** is often helpful for seasonal depression but might be less effective for non-seasonal depression.
- **Music therapy** can be helpful for depression. It's usually done one-on-one or in groups with a music therapist.
- **Omega-3 fatty acids** may help depression medications work faster (acceleration). Research about using these for anxiety seems weak. Studies typically used doses of 1 to 2 grams of eicosapentaenoic acid daily. Harmful side effects are unlikely at these doses.
- **Creatine** may help enhance depression medication. It has been used for this purpose at 5 grams per day. Creatine has been known to cause weight gain from water weight, but it mostly seems safe. Concerns about kidney injury seem to be exaggerated, but creatine should be avoided in patients with kidney disease to be on the safe side.
- **Rhodiola** is an herb that may accelerate depression medications and improve anxiety. It has been used for this purpose at 0.3 to 0.6 grams per day, and this dose appears to have minimal side effects.
- **Zinc** is a mineral that may enhance depression and anxiety medications. It has been used for depression at

around 25 mg per day and obsessive-compulsive disorder at 440 mg per day. It seems safe at doses under 40 mg.

- **Inositol** (a natural relative of glucose) may help with panic disorder and OCD. It appears to be safe in the amounts and time frames used in studies (12-18 mg daily for 4-6 weeks).
- **L-lysine (and L-arginine)** are amino acids that may reduce anxiety. They appear to be safe in the amounts and time frames used in studies (3 grams of each daily for weeks).

These seem so-so:

- **Carnitine** is an amino acid that may be useful for depression at doses between 1 to 3 mg per day, but it may increase the risk of cardiovascular disease, seizures, and gastrointestinal complaints.
- **Sarcosine** is another amino acid being studied for depression, but the research is weak.
- **Glycyrrhizic acid (AKA glycyrrhizin)** is found in licorice root. At doses of 150 mg three times a day, it may be useful for accelerating depression medications, but it may cause issues with high blood pressure and electrolyte imbalance.
- **Sleep deprivation therapy** involves staying awake for about 36 hours at a time and may accelerate depression medication. However, lack of sleep is probably not healthy in the long run, so this isn't a long-term treatment.
- **Valerian root and passionflower** have weak evidence for helping anxiety and are rarely very harmful, but may cause excessive drowsiness. Valerian root might cause

liver damage.

- **Chamomile** has weak evidence for helping anxiety. It may enhance the blood-thinning effects of other medications.
- **Lavender oil** (taken orally) may help with anxiety. It appears to be safe in the amounts and time frames used in studies (80 mg daily for 6 weeks).

Be cautious:

- **St. John's wort** is an herb that is marketed to help anxiety and depression. Unfortunately, it lacks regulation, has weak evidence behind it, and interacts poorly with a lot of medications.
- **Saffron** has weak evidence for anxiety and depression. Doses studied were generally up to 100 mg daily for up to 26 weeks. Doses over 5,000 mg daily may cause poisoning and death.
- **Cannabinoids (THC and CBD)** lack strong data that show usefulness in depression. THC in particular may be harmful due to reports of increased suicidal death. It's unclear what their role is in anxiety; they may be somewhat helpful in the short term, but don't seem to have any long-term benefits. Cannabis may worsen anxiety. Smoking and vaping can also lead to lung damage.
- **Kava-kava** has weak evidence for helping anxiety. It may cause liver failure.

There are many other alternative treatments that don't have clear pros and cons. These include homeopathy, aromatherapy, and more.

Psilocybin (a hallucinogen from mushrooms) and **nitrous oxide** are interesting new depression treatments that may be effective for patients who are already receiving other treatments, but treatment with these should be monitored.

All right, let's move on to some standard medications!

TREATMENT WITH MEDICATIONS

The most common medications for treating mood issues are selective serotonin reuptake inhibitors (SSRIs) and serotonin and norepinephrine reuptake inhibitors (SNRIs). These two families of medications are very similar, but have a few differences: SNRIs appear to be slightly better for depression but tend to cause more stomach problems and raise blood pressure by about 1-2 mmHg at low doses and 10-15 mmHg at high doses. SSRIs (specifically sertraline) have the most reassuring data to OK their use during pregnancy. These medications can treat depression, anxiety, panic disorder, post-traumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD), and more. They seem to function by increasing the amount of time that your serotonin hormone spends between brain cells. **You may have to take these medications for at least two weeks straight for them to start working, and their effects might not max out until two months or later.** This is why I usually have people take the medication for at least two weeks before deciding what to do with the dose.

The side effects usually aren't bad, but some people get dizziness, insomnia, stomach upset, loss of sexual desire, and more. In general, people with closed-angle glaucoma should avoid both of these medications and other medications like trazodone and

mirtazapine, which I'll discuss below. Liver injury and serotonin overload are rare. These medications also have a small effect on thinning blood and bones. **Sometimes these side effects go away.** If the side effects don't seem to go away within two months or sooner, then I typically switch the medication or decrease the dose. All of the SSRIs work about as well as each other, but the most common SSRI I prescribe is fluoxetine since it doesn't seem to cause weight gain; unfortunately, the trade-offs of fluoxetine include more insomnia and more interactions with certain medications. On the bright side, even though antidepressants may cause insomnia and weight gain, fixing depression might fix your racing thoughts at bedtime and help you stop stress-eating!

If your medication isn't working well (even at higher doses), then it's time to consider switching to another medication. However, if your medication is working pretty well, then adding a second medication may be an option. One way to estimate if someone has improved a lot (besides just asking them how they feel) is having them fill out a survey like the PHQ-9. A low score is good, so if your score ever drops by over 50%, then that's great! If your score drops by less than 25%, then your treatment probably isn't very effective.

Some other good medications to consider are what I consider to be multiple-use medications.

Trazodone is an antidepressant that works well for depression-related insomnia but doesn't work as well for other types of insomnia.

Similarly, mirtazapine is an antidepressant that can help with mood-related insomnia, but it tends to cause weight gain and

increase your appetite, so it might be extra helpful in people who are underweight.

Bupropion is an antidepressant that is also used for ADHD, quitting smoking, weight loss, and female sexual function. It's a mild stimulant. It doesn't mix well with heavy alcohol use and should be avoided in people at risk for seizures.

If we've tried a few of these medications and they haven't worked, then I generally move on to my "second-choice" medications. These aren't my first choice because they tend to have worse side effects. I might suggest a psychiatry referral at this point to get a specialist's opinion. The second-choice medications that I've managed most frequently include tricyclic antidepressants (TCAs) and antipsychotics.

You might be thinking, "Whoa, antipsychotics?" Yep, antipsychotics are strong medications that are reserved for tougher issues. These medications tend to cause weight gain and strange symptoms, like restlessness and uncontrollable movements.

TCAs are often used to treat migraines and chronic back pain, which I see a lot in my office. Their side effects are similar to the side effects of SSRIs and SNRIs, but they're generally worse (e.g., MORE nausea, MORE sedation, MORE weight gain, etc.). However, some TCAs have fewer side effects than others.

Some other ways to boost the effectiveness of antidepressants could be using buspirone, T3 hormone, lithium, electroconvulsive therapy, transcranial magnetic stimulation, and more. I haven't had much experience with prescribing these, but I sometimes

prescribe buspirone for anxiety.

There's research being done in the field of genetic testing to figure out what antidepressants might work best for someone. It's currently unclear how useful genetic testing is, and I have no experience ordering these tests, but it might make a difference for people in the future! Currently, if a patient is thinking about starting an antidepressant, I like to ask the patient if any family members have done well with certain antidepressants since those antidepressants might be a good match for the patient too. Admittedly, I don't think the evidence behind my strategy is strong, but I feel like it at least creates a shared family experience, which could strengthen a patient's support system. However, I usually tailor my antidepressant recommendations based on their side effects, as I mentioned above.

A warning that's listed on antidepressants says that they might increase suicidal thoughts in people who are 24 years old or younger. This belief started around the 1990s due to reports that children on antidepressants were having more suicidal thoughts and engaging in more nonfatal self-harming activities than children NOT on antidepressants. This was alarming, but suicidal DEATH didn't increase. **In fact, research has generally shown lower rates of suicidal death in people who treat their depression.** Thus, as far as suicide goes, it seems like the benefits of antidepressants outweigh the risks.

If you've been taking an antidepressant for more than a week, please do NOT suddenly stop taking it, since you may go through withdrawal. Sweating and tremors aren't fun! These medications aren't addictive in the traditional sense, but you should ask your provider to help you gradually wean off of them.

One exception is fluoxetine, which doesn't need to be tapered off.

Additionally, we recommend staying on antidepressants for at least six months if they're working, since stopping or decreasing them too soon might cause your depression to come back. For people who had severe depression or are at a high risk of relapsing (like people with anxiety, abuse, and/or childhood depression), continuing antidepressants for at least a year is recommended.

Something researchers noticed is that placebo pills (fake pills) can sometimes help depression. This is probably because there's a large mental component to treating depression, and people taking fake pills from these researchers had to meet health care providers regularly, which probably helped their depression. Overall, placebo pills seem to be 29% effective, and medications seem to be 43% effective.

Anxiety disorders are treated pretty similarly to depressive disorders. Counseling is helpful. SSRIs are generally 60-70% effective, and placebo pills are about 40% effective. Buspirone, gabapentin, pregabalin, TCAs, and antipsychotics may be helpful options as well. Staying on treatment for at least a year is suggested.

The nice thing about buspirone (which is thought to work by affecting serotonin and dopamine) is that it doesn't cause many side effects except dizziness. Unfortunately, buspirone is not a very effective medication by itself, so it's best used on top of another medication.

Gabapentin and pregabalin are two similar medications that can

help anxiety. They also have multiple uses. For example, they can be used for nerve pain, seizures, and restless leg syndrome. However, they may cause drowsiness and weight gain.

For people who have anxiety attacks and panic attacks, taking an as-needed medication may be helpful. My favorite medication for this is hydroxyzine, which is an antihistamine that's similar to diphenhydramine (Benadryl). It helps you relax within 15 to 30 minutes of taking it, but we don't go too high on the dose because we don't want you to be too drowsy. For people who get a lot of shaking and a racing heartbeat in social settings, a beta blocker medication can be taken before speaking or performing. I rarely prescribe benzodiazepines (like Xanax), since they are addictive and suppress your breathing, which can be deadly. Because of safety concerns, benzodiazepines are controlled substances that are regulated by the DEA (Drug Enforcement Administration).

PTSD treatment is a little different from depression and anxiety treatment. For example, talk therapy is more effective for treating PTSD than medications are. However, medications like SSRIs can still be used. SNRIs are also reasonable, but we're not sure if they're as good as SSRIs in this case. Prazosin is a good medication for PTSD-related nightmares and augmenting other treatments.

ATTENTION-DEFICIT AND HYPERACTIVITY

Attention-deficit/hyperactivity disorder (ADHD) isn't technically a mood disorder, but I included it in this chapter because of how often I see it and how much it overlaps with mood disorders. People can have a depressive disorder, an anxiety disorder, and

ADHD all at the same time!

Fun fact: "ADD" (attention deficit disorder) is an outdated term. Now we use terms like "inattentive-type ADHD" and "hyperactive-type ADHD". If people have many signs of attention deficit AND hyperactivity, then we call it "combined-type ADHD".

The youngest age that someone can be diagnosed with ADHD is four years old. There isn't an "oldest age" that someone can be diagnosed, but since most people with ADHD have symptoms before they turn 12, it's more difficult to diagnose someone who started to notice symptoms as an adult. This is sometimes known as "late-onset ADHD". A possible explanation for late-onset ADHD is that some people probably had ADHD as children, but their symptoms went undiagnosed.

It's unclear if talk therapy is helpful for people with ADHD who don't have any other mental health issues. For these people, medication is usually the way to go.

Unfortunately, it's not always easy to walk into your provider's office (as an adult) and get ADHD medication right away, since many ADHD medications are controlled substances. You generally need some kind of proof of your ADHD diagnosis. The strongest proof would be a copy of your medical records with your diagnosis and medications listed. If you don't have a diagnosis yet, then the usual process is to refer you to a psychologist or counselor who will talk to you about your mental health history. They will help determine if you have ADHD and other diagnoses.

When I was in the early phases of my medical training, I thought,

"I wonder why I don't see many primary care doctors diagnosing adults with ADHD. I wonder if psychiatrists feel more comfortable doing it." Eventually, I shadowed a psychiatrist at my hospital, and he told me that even HE refers people for a psychological evaluation. "You really want your patient to get a full mental health evaluation before getting a diagnosis," he said. I'm sure that some doctors DO diagnose people with ADHD, but I don't see it that often.

OK, let's talk about medications.

The most common ADHD medications for adults are stimulants like amphetamines and methylphenidate. They're very similar to each other, but amphetamines tend to work better for adults. All of these medications affect the body's dopamine and norepinephrine levels. Common side effects include loss of appetite, headaches, palpitations, higher blood pressure (by about 2 to 14 mmHg), insomnia, jitteriness, and mood swings (though sometimes mood may be IMPROVED). Less common side effects include circulatory issues, tics, and suicidal thoughts. For people with heart issues, a cardiac evaluation is recommended before starting these medications (e.g., EKG, cardiology referral, etc.). These drugs should also be avoided in glaucoma.

To avoid becoming desensitized to these medications, the starting dose should be as low as possible, and doses should be skipped when possible (like on weekends). **It takes about 1 to 4 weeks to really judge if a dose is working or not.** Some people feel a "crash" when their medication doesn't last long enough, so we usually recommend longer-acting stimulants in these cases. On the other hand, some people feel like their medication may last too long and cause insomnia, so a shorter-acting stimulant may

be a better option for them.

As I mentioned above, someone who has both depression and ADHD may benefit from starting bupropion as their first medication, since bupropion can treat both conditions.

Since ADHD medications can be addicting, people who have a substance use disorder (e.g. people who can't stop drinking or smoking) should probably try a non-stimulant medication like atomoxetine first, which is less addicting and less abused. The side effects of atomoxetine are similar to those of stimulants (such as decreased appetite and heart problems) since they both affect your norepinephrine levels. Unlike stimulants, **atomoxetine generally takes longer to build up in the body, so you should wait for at least two weeks before increasing the dose.**

Some less common ADHD medications include clonidine, guanfacine, and modafinil. These are more often used in children with ADHD since they might not be as effective in adults.

On a final note, ADHD medications have different levels of safety during pregnancy, so the pros and cons should be weighed when planning for a baby.

That wraps things up! I hope that mental health will be viewed in a more positive light in the future.

CHAPTER ELEVEN

Insomnia

SLEEP IS FOR THE WEEK

It's difficult to determine exactly how much sleep every individual needs, but it partly depends on your age. Most infants need at least 10 hours of sleep, most young adults need 6 to 11 hours of sleep, and most older adults need 5 to 9 hours of sleep. Some people don't get enough sleep during the week and try to pay back their "sleep debt" on the weekend, but we're not sure how healthy this is; **negative side effects (like high blood pressure and weight gain) might happen even if you catch up on your sleep debt.**

About one-third to two-thirds of adults complain of insomnia, and about 10 to 15% of adults say that their insomnia causes problems during the day. Insomnia can be hereditary, and it seems to be more common in women, especially around or after menopause. Interestingly, although sleep problems increase with age, older adults are less likely to complain about their insomnia; this might be because older adults have lower expectations about sleep and have more flexible schedules.

Insomnia is more common in people who are stressed. Many medical conditions are also associated with insomnia. For

example, a person with anxiety may have trouble falling asleep due to racing thoughts, and a person with heartburn may have trouble lying down in bed. An estimated 50% of people with chronic insomnia have a psychiatric disorder, and most people with a psychiatric disorder have insomnia.

Some other contributors to insomnia include substances and medications. Both stimulants and depressants (nicotine, caffeine, alcohol, etc.) can negatively impact sleep. Other common medications include steroids, antidepressants, and beta blockers. **People sometimes use alcohol to help them fall asleep, but alcohol probably reduces sleep quality and weakens the throat muscles,** which leads to more snoring and poor oxygen flow to your brain. The end result? You're more tired in the morning.

Insomnia can be categorized as sleep-onset insomnia (trouble falling asleep), sleep-maintenance insomnia (trouble staying asleep), or both. Everyone has insomnia every now and then, but insomnia is generally considered a chronic disorder if it lasts for weeks and happens at least three times per week. If you can't fall asleep within 20 minutes (for children and younger adults) or 30 minutes (for older adults), that's not great.

There are other sleep disorders that technically aren't insomnia, but can look like insomnia. For example, sleep apnea is a disorder where you hold your breath sometimes while sleeping, which can wake people up; some people with apnea will sleep all night but feel tired in the morning. Leg movement problems (like restless leg syndrome and periodic limb movements) may also wake you up. Additionally, some people may struggle with adjusting their natural circadian rhythms, such as night shift workers and blind people.

Special sleep tests aren't required for most people with insomnia, but anyone can buy sleep monitors, so I'll talk about them here. The most reliable mobile sleep monitor is a medical actigraphy device, which you can wear on your wrist. Actigraphy seems reliable, but I have no experience ordering them. You can also buy consumer-grade sleep monitors and phone apps that monitor your sleep. These consumer "wearables and near-ables" might be less accurate than medically prescribed devices, but they might be useful for tracking improvements in your sleep. Some of these devices may compare REM and non-REM sleep, but the functions of sleep stages (e.g., learning and brain healing) aren't completely understood. **In general, keeping a sleep diary for yourself is the most useful "testing" you can do.** Your sleep diary should be a log of many things that you should write down every day:

- how many naps you took
- how long your naps were
- what time you went to bed
- how long it took for you to fall asleep
- how many times you woke up
- how long you stayed awake
- how you felt the next morning
- how comfortable your sleep environment was
- whether you felt like your sleep was good or bad
- …and more!

Chronic insomnia causes more than just physical and mental exhaustion; it can lead to mood disorders and earlier death from diseases like high blood pressure, diabetes, and obesity.

KNOCK YOURSELF OUT

The treatment of insomnia should be focused on fixing what's causing your insomnia. For example, if someone has heartburn when lying down to sleep, then heartburn treatment should be recommended.

Another part of treatment is improving our sleep habits. This is called "practicing good sleep hygiene". There are counselors and talk therapists who specialize in insomnia. People with chronic insomnia are recommended to see a therapist for insomnia-based cognitive behavioral therapy (CBT-I), rather than only taking medications for insomnia. CBT-I helps set good rules for sleep hygiene, in addition to promoting a more relaxed mind. Some therapists do sleep restriction therapy, but I don't know much about it.

Research has shown that CBT-I by itself (for at least four sessions) is better than medications by themselves. Combining medications with CBT-I may bring quick relief while progress is still being made in CBT-I. However, medications may actually worsen your insomnia in the long run.

Here are some general sleep hygiene tips:

1. Sleep at the same time every night and get up at the same time every day. This puts your body into a consistent rhythm.
2. Set an alarm for about 1 hour before bed, so you can remember to start getting ready for bed instead of rushing to get ready.
3. Avoid naps during the day, since they can make it harder to sleep later.
4. A light snack is fine before bed if you can't sleep on an

empty stomach, but if you have heartburn, you might want to avoid eating anything two to four hours before bed.

5. Stay hydrated before bed, but make sure it isn't causing you to wake up to urinate too much.
6. Your room should be at a comfortable temperature, quiet, and good at blocking out sunlight.
7. If you can't fall asleep within 20 to 30 minutes, then get out of bed and do something relaxing (like reading).
8. You shouldn't do any activities in bed besides sleeping and having sex. This trains your brain to focus on sleeping when you're in bed.
9. Avoid looking at screens before bedtime, since lights can disturb your circadian rhythm. If you MUST look at a screen before bed, try wearing blue-light-filtering glasses (they're usually orange-tinted), or turn on a blue-light filter for your screen.
10. Avoid exercising within 1 hour of bedtime.
11. Relax or meditate before bedtime.

There are some interesting sleep schedules that people have come up with called "polyphasic sleep schedules". These schedules involve sleeping more than twice per day. One example of a polyphasic sleep schedule is the Uberman schedule, which involves taking 20-minute naps up to eight times per day. I haven't seen many reliable sources speak about the effectiveness of polyphasic sleep schedules, so I wouldn't strongly recommend them. However, you could give them a try if you have a flexible work schedule.

Is it possible to sleep too much? We're not sure. Perhaps sleeping too much is a sign that the body isn't getting good sleep. There's

also sleep inertia, which is the "drunk" feeling that some people get when they wake up. Sleep inertia may happen more with long naps than with short naps. While naps should ideally be avoided, limiting naps to under 30 minutes or under 10 minutes may help prevent sleep inertia when you wake up from the nap.

There are many herbs and supplements marketed as sleep aids, but the lack of regulation combined with iffy effectiveness and safety make them less-than-ideal choices. Notably, kava and valerian may cause severe liver damage. Cannabis is being studied, but it's not routinely recommended yet, and smoking can cause lung damage.

Melatonin may help sleep-onset insomnia, but the evidence isn't very strong. It might work well for people with delayed circadian rhythms, like night owls. There's a wide range of doses. **Doses below 1 mg might work just as well as higher doses.** Reported side effects include daytime sleepiness, vivid dreams, and stomach cramps, but there haven't been any cases of serious harm from taking a lot of melatonin. However, the safety of long-term use is uncertain. We lack good data about its safety during pregnancy, but no serious harms have been reported yet. **It works best when taken a few hours before bedtime.**

SLEEP MEDICATIONS

Before we go on, remember that none of these medications below are guaranteed to work, and CBT-I is strongly recommended to help insomnia.

Ramelteon is a melatonin receptor medication that is used for

sleep-onset insomnia. Unfortunately, it doesn't seem to be much more effective than melatonin, and it has similar strengths and side effects.

There are many FDA-approved over-the-counter medications that are marketed as sleep aids. They usually contain antihistamines like diphenhydramine (Benadryl) and are generally safe, but can worsen dizziness, stomach discomfort, dry mouth, and urination issues. Doxylamine, a prescription antihistamine, is very safe during pregnancy.

Doxepin is a tricyclic antidepressant that — at low doses — has the interesting ability to act like an antihistamine. It's effective for insomnia at doses between 3 to 6 mg, but 10 mg is acceptable as well.

There are some medications that primarily treat other medical conditions, but can be used as off-label options for insomnia. For example, trazodone and mirtazapine are antidepressants that work well for depression-related insomnia, but not as well for other kinds of insomnia. Interestingly, mirtazapine loses its insomnia-treating effects at higher doses. I talk about these drugs more in my chapter on mood issues.

Gabapentin (an anti-seizure medication) and clonidine (a blood pressure medication) are other examples of multiple-use sleep medicines that don't work very well for insomnia.

The medications that I'll discuss next are controlled substances, which means that there are more regulations involved in prescribing them than there are with most other medications. Because of these regulations, I rarely start these in my patients.

Benzodiazepine BZRAs (like triazolam and temazepam) are medications I avoid prescribing due to their addictive potential, increased tendency to cause daytime sleepiness, and potential for slowing down your breathing fatally.

Non-benzodiazepine benzodiazepine receptor agonists (like zolpidem/Ambien) are controlled substances as well, but they seem less addictive and are less likely to cause fatal breathing issues. They're used for both kinds of insomnia, but the longer-lasting ones are better for keeping you asleep.

Dual orexin receptor antagonists (DORAs, like suvorexant) are controlled substances again, but have no evidence of addiction and don't appear to slow down breathing. However, until we know more about their safety, they should be avoided in people with severe lung disease, severe sleep apnea, and severe liver disease. They're used for both kinds of insomnia. I have no experience prescribing these yet, but I've heard that these medications are expensive.

Well, that covers everything! Have a good night.

Part Four

Conclusions

CHAPTER TWELVE

Final Thoughts

Thanks for reading my book! I hope you found it helpful. There's a lot of medical information out there, so it can be challenging to know what to think. This challenge was made extremely obvious during the COVID-19 pandemic.

Additionally, there are a lot of gray areas and nuance in medicine, so I tried to keep my advice as general as possible. In doing so, I believe that most doctors would agree with much of what I've written.

I enjoy helping out students, so if you're at any stage in training (including pre-medicine), feel free to reach out to me at drandrewzheng@gmail.com!

I wish you the best of luck. If you ever see me outside my office, feel free to say hello!