

## **PRAISE FOR** ***THE CONTINUOUS GLUCOSE MONITOR REVOLUTION***

“As an Internal Medicine doctor focusing on treating metabolic disease, I highly recommend *The Continuous Glucose Monitor Revolution*. The book is a ‘must read’ for anyone struggling with metabolic disease, whether they be nondiabetic, prediabetic or diabetic... as well as the clinicians treating them.

The CGM is one of the most powerful tools in modern medicine and Dr. Kolodzik’s book provides the most comprehensive explanation of its proper clinical use yet. He answers all the frequently asked questions related to using a CGM to improve health and lose weight. Dr. Kolodzik has extensive experience as an ER physician and also has years of expertise in treating metabolic disease. As a result, he is able to explain complicated topics in an easy-to-understand manner. I will be recommending this book to my patients and colleagues and will have copies available in my office.

Thank you, Dr. Kolodzik for providing this critically important information.”

**Brian Lenzkes, MD**  
**Owner, Low Carb MD San Diego**  
**Co-host, *The Low Carb MD Podcast***

“Continuous glucose monitoring is an essential tool people can use to take back control of their health. As the saying goes, ‘What gets measured gets managed.’ It is difficult to improve metabolic health if we don’t know our numbers. And *The Continuous Glucose Monitor Revolution* shows us how to know those numbers and interpret them. I recommend a continuous glucose monitor to nearly all my patients at Ovadia Heart Health, and I recommend strongly that anyone who wants to improve their health should read *The Continuous Glucose Monitor Revolution*.”

**Philip Ovadia, MD**  
**Board Certified Cardiothoracic Surgeon**  
**Award-Winning, Best Selling Author, Stay Off My Operating Table**  
**Founder of Ovadia Heart Health**

*“The Continuous Glucose Monitor Revolution* provides all the insights and guidance needed to effectively lose weight and achieve a healthier and longer active life. Early in my career, decades ago, I was taught a business and leadership principal, “you cannot manage, what you cannot measure”. Now, due in large part to the breakthrough invention of the CGM the same principle holds true for improving your metabolic health and reaching your weight loss goals. With Dr. Kolodzik’s guidance and a CGM I learned to embrace a lifestyle of eating healthier, and greatly reduced my blood glucose levels. The result was weight loss and improved health. I’ve struggled for a lifetime to maintain a proper diet and weight. Finally, for the first time in my life, using all the principles that you’ll find in this book, I’m not struggling anymore. Now it’s your turn. Get this book, follow its principles, and reap the healing rewards.”

**William DeFries**

**CEO and Owner, Copp Integrated Systems**

“I strongly recommend *The Continuous Glucose Monitor Revolution* as essential reading to all of my patients. This book answers all the common questions regarding CGM use. Dr. Kolodzik exposes the importance of 24/7 blood glucose monitoring as the key to weight loss and optimal metabolic health. I am a huge fan of both CGMs and providing patients detailed information, as is delivered in these pages, to use these devices effectively.

Thank you for writing this book as it will unquestionably and very positively impact the lives of all who read it.”

**Annette Bosworth, MD**

**Owner, Meaningful Medicine**

**Author of *The Keto Continuum and Any Way You Can***

“In *The Continuous Glucose Monitor Revolution*, Dr. Kolodzik shares the tools and secrets by which any person, no matter their starting point, can reach their optimal weight and physical well-being goals. Using the cutting-edge technology of CGM, and the other techniques outlined in these pages, he provides a nearly surefire approach to improved health.

Achieving optimal weight, nutrition, and fitness is essential for high performance athletes. Having coached dozens of High School State Champions and NCAA All Americans, as well as NCAA National

Champions and Olympic Champions this is a process I know something about. Anyone serious about a future of health, fitness and optimal weight should read this book and follow this plan.”

**Jeff Jordan**  
**Hall of Fame Wrestling Coach**  
**Founder and CEO, Jeff Jordan State Champ Camps**  
**Co-Founder, Rudis Wrestling Sportswear**

“CGMs GET RESULTS! I know this because I lost fifty pounds, reversed disease, and enhanced my health using Dr. Kolodzik’s plan. Finally, a pragmatic book providing detailed insights and instruction on how nondiabetics, prediabetics and even diabetics can use a CGM as part of a comprehensive data driven program. As evidenced by his thousands of satisfied patients, any person embracing the concepts in this book will both lose weight and significantly improve their health.”

**Lynn Routsong-Weichers, MSW**  
**President, Midwest Counseling Centers**

“The epidemics of obesity and diabetes happened for a reason. Dr. Kolodzik understands how our high carbohydrate eating habits over the last fifty years have led to 60% of Americans being overweight. In this book he explains how a CGM-guided low carb diet can reverse obesity and the diseases associated with being overweight.

He is absolutely correct that CGM technology is a tool like no other in helping patients achieve weight loss and better health. The plan he outlines in these pages offers an actionable program that equals success for his patients. I have utilized a CGM myself and have experienced firsthand how this life changing technology can mean the difference between weight loss success or failure. *The Continuous Glucose Monitor Revolution* provides a groundbreaking approach to successful dieting, disease reversal, and better health.”

**Terry O’Brien**  
**CEO and Owner, Trilevel Productions**

“The latest in longevity research is loud and clear: Diseases of aging are optional. In fact, it’s possible to age with joy and health. In addition to an

ancestral diet, new and not-so-new medical technologies can improve our odds of quantity and quality of life. One such technology is continuous glucose monitoring, which Paul Kolodzik MD introduces to non-diabetics in *The Continuous Glucose Monitoring Revolution*. This book shows how managing blood glucose levels can improve many metabolic syndrome symptoms and conditions in the short term and revolutionize long term health overall.”

**Robert Lufkin, MD**  
**Clinical Professor, USC and UCLA Schools of Medicine**  
**Director of Metabolic Imaging,**  
**Prohealth Advanced Imaging Network**

“A CGM is an immensely powerful tool for behavior change. As an experienced metabolic health physician, I routinely use this cutting-edge technology to help my patients reverse insulin resistance, realize weight loss success, and improve metabolic health. As the first book of its kind, *The Continuous Glucose Monitor Revolution* provides a step-by-step plan for better health: CGM use, low carb dieting, intermittent fasting, strength training (to reduce insulin resistance) and even the use of the new FDA-approved GLP-1 weight loss medications (Ozempic, Wegovy, semaglutide). Whether you are prediabetic, diabetic, or simply a little or a lot overweight, the techniques in this book will improve your health and your life.”

**Elie Jarrouge, MD**  
**Nationally Recognized Metabolic Health Physician Leader**  
**Owner, Metabolic Health MD**  
**Assistant Professor, Baylor College of Medicine**

“This book is packed with compelling insights and specific instruction on a CGM data driven approach to weight loss and better health. As a career emergency physician and EMS medical director I have witnessed the acute medical crisis resulting from high blood glucose, insulin resistance, and obesity. The Continuous Glucose Monitor Revolution lays out a simple and effective step by step plan for weight loss and better health. Whether you are looking to completely reverse your prediabetes, lower your blood



pressure or cholesterol, reduce medication needs, or simply lose weight, Dr. Kolodzik provides a plan that gets results. The time has come for CGM use by nondiabetics.”

**Dave Keseg, MD, FACEP**  
**Chief Medical Officer, OFFOR Health**  
**Former Medical Director, Columbus, Ohio Fire & EMS**

“We should all be grateful for *The Continuous Glucose Monitor Revolution*. It is a human right to know what your blood sugar is at any time if that is your choosing. The simple, clear, understandable, accurate information and guidance this book offers are actionable for anyone who wants to improve their health. Metabolic illness cuts into every field of medicine and health and we must work together to reverse it. We have not yet completely flattened the curve, but *The Continuous Glucose Monitor Revolution* is a great contribution moving us in that direction.”

**Mark Cucuzzella, MD, FAAFP**  
**Professor, University of West Virginia**  
**Lieutenant Colonel, US Air Force Reserve**  
**CEO and Owner of Two Rivers Treads**

## **DISCLAIMER**

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# **THE CONTINUOUS GLUCOSE MONITOR REVOLUTION**

Lose Weight, Look Great, and Live Longer with  
Continuous Glucose Monitoring

Paul Kolodzik, MD

Metabolic MD  
Bellbrook, Ohio

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The conversations in the book are based on the author's recollections, though they are not intended to represent word-for-word transcripts. Rather, the author has retold them in a way that communicates the meaning of what was said. In the author's humble opinion, the essence of the dialogue is accurate in all instances.

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*To my patients who inspire me every day, and who with their critical thinking and courage have embraced a less traveled path. You are not the only beneficiaries of your success, because you are trail blazers to others who will follow.*

## TELL ME WHAT YOU THINK

Let other readers know what you thought of *The Continuous Glucose Monitor Revolution*. Please write an honest review for this book on your favorite online bookshop.



## BEYOND THE BOOK WITH DR. PAUL

I hope this is the last diet book you ever read. These pages have presented more than just a diet; CGMs provide the opportunity for a meaningful and permanent lifestyle change. The outcome of this change being both weight loss and improved health.

You can follow all the directions in this book yourself if you have a physician to prescribe the CGM for nondiabetic use and provide reasonable expertise to help you set attainable goals and implement sustainable habits. But very few people have that. Experienced metabolic-health providers versed in these techniques are still relatively rare. If you don't have ready access to a medical professional with a team to provide these services, let us know if we can help. We provide services in the states I am licensed in (OH, FL, AZ, and IN, with more to come soon), and sometimes patients drive (or even fly) into my licensed states so we can work together.

If you feel I and my team can help, take a few moments to complete the New Patient Inquiry on our website. Once this information is received, a member of our team will contact you to discuss how we can help you meet and exceed your specific goals related to weight loss and optimal health.

**Go to [www.doctorkolo.com/new-patient-inquiry](http://www.doctorkolo.com/new-patient-inquiry).**





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“When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind.”

**Lord Kelvin**  
**Scottish-Irish physicist**  
**1825 - 1907**



# FOREWORD BY DR. TRO KALAYJIAN

The best way to start a low-carb diet is not to start a low-carb diet. It's to know *why*.

On my doctortro.com blog, I've published hundreds of resources to help patients, clients, and the general public eat few to no carbohydrates, improve their blood glucose levels, lose incredible amounts of weight, and live their best lives ever.

However, this is *how-to* content. It's what you're looking for if you know *why* you're choosing the low- or no-carb path. But as my friend Paul Kolodzik MD has also learned, tips are not enough. Truth, however, is. Specifically, the truth about what carbs do to *your* body.

And the best technology we have on the market for that is *The Continuous Glucose Monitor*, or CGM. Diabetics, prediabetics, and the population at large benefit from knowing the second what happens when certain foods enter their bodies. Choosing the low-carb path to health, wellness, and happiness then becomes easy. And sticking with it, even easier. As Dr. K. and others say, "What gets measured gets managed." Many dietitians and health coaches and general practitioners are measuring the wrong numbers, and they're measuring them too late. CGM devices provide real-time data that patients and their physicians can leverage into real-world lifestyle changes.

*The Continuous Glucose Monitor Revolution* is the first book to explain how nondiabetics can use these devices together with a nutrition and fitness plan to unlock all their benefits—and live better, longer lives.

If you're considering a low-carb diet but have trouble sticking with diets in particular or new habits in general, read this book in full. You will get all the motivation you need to make positive changes—and keep them.

**–Dr. Tro Kalayjian,  
Board-Certified Physician  
Medical Director, [www.doctortro.com](http://www.doctortro.com)**



# CHAPTER 1



## YOU HAVEN'T TRIED THIS YET

**H**as the following situation happened to you? You visit the doctor for your regular checkup. You get your blood pressure taken, and you've had your blood work done. You want to know what's going on with your body. Do you have risks? How are you doing? The doctor sits at the computer, typing away but saying very little. You know you only get twenty minutes with him.

You have this uncomfortable feeling that something's not right.

Your blood pressure's a little high, and the doctor adjusts your medication. Your blood sugar is a little high, too, so you are told to watch your diet. You've gained some unwanted weight, and you are asked to simply "eat less and exercise more." Not a lot of specifics are offered on how to do that. Seems like the symptoms are being treated without a lot of detailed advice or instruction on how to get to the root cause of the issues. And throughout the visit, the doctor seems rushed as he types away with more focus on the computer than on you.

If that situation or one like it has happened to you, please know that you are not alone.

For most people, doctor visits only happen every six months or yearly. And many doctors have ultra-brief conversations with their patients about

the most important aspects of their health. They say we should make changes, but they often fail to give us actionable advice. So we come away feeling empty. And our concerns are often unaddressed. We don't know what to do or how to improve our health.



*Too typical annual physician visit. A rushed doctor focused on his computer.*

After a few of these less-than-satisfying conversations with your doctor, you might have already tried to take your health into your own hands. To lose weight, you try the calories-in, calories-out model. You try a crash (drastic calorie reduction) diet or some new fad diet from TV or the internet. Weight Watchers, Nutrisystem, support groups, fitness programs, supplements and vitamins—the whole nine yards.

Usually, you see very little progress for all that effort. And when there is progress, it never seems to be sustained for very long.

When you go back to the doctor, you're probably disappointed once again. Every attempt at improving your health causes more and more stress. You want something new; you want direction; you want something you can have confidence in as proven and effective. This is where you find the good news. I wrote this book to introduce you to something you haven't tried yet to take back control of your health, improve your quality of life, and finally ditch tactic chasing.

What you're about to learn is a data-driven approach to weight loss and metabolic-health improvement. And it could not have come at a better time



because left untreated, or at least incompletely treated with only a “disease maintenance” approach, your health frustrations and health can develop into an “event”—a trip to the emergency room.

I've seen that exact situation time and time again for over thirty years. As an emergency department physician, I've been on the front lines when chronic disease evolves into an emergent health crisis—a stroke, a heart attack, acute kidney failure, or some other life-changing condition. Many of my patients have had life-threatening symptoms or conditions that their many diet attempts and different fitness programs promised to prevent, but didn't. They couldn't sustain their efforts, and they ended up as my patient on the cart in the critical care room of the emergency department, their life forever changed.



*A high percentage of patients with critical illness in the ER are there as a result of vascular diseases.  
A major contributor to vascular disease is high blood glucose.*

As a career emergency physician, it has been a privilege being involved in some of the most important moments in people's lives—good and bad. Consoling my patients in times of trouble: for example, caringly and sympathetically delivering news of a just-diagnosed cancer. Or sharing the good news that a patient will make a full recovery.

I've been through it all. It's been an extremely satisfying career. This is true when I am able to manage my patients to a good outcome but also when my job is simply to provide information, be kind, console and offer hope when a positive outcome is not achievable.

But I learned something else in those thirty years—obesity and high blood sugar *kill*. Sometimes, maybe even worse, these conditions leave

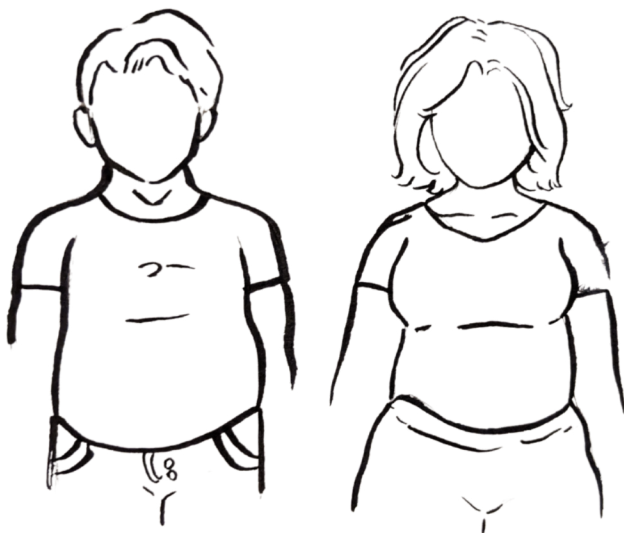
patients permanently diseased and disabled. Most of the chronic disease we see today in the United States comes from the food we put in our bodies every day and how much (or how little) we move them. The ER care of gunshot wounds and drug overdoses gets all the press. But what my colleagues and I care for in the ER every day, day in and day out, all day long, are the vascular (blood vessel) issues like strokes, heart attacks, and diabetic emergencies, all of which are directly or indirectly correlated with diet and activity, and most of which are entirely preventable.

Based on this experience in the ER, I pursued certification by the American Board of Preventive Medicine seven years ago. The care I now provide patients in my private metabolic-health clinic is proactive. I help my patients prevent and reverse disease. Rather than reacting to the health crises brought on by high blood pressure, high blood sugar, and high cholesterol, I help prevent my patients from ever arriving at that point. My time is now spent helping patients lose weight, undo prediabetes, lower blood pressure, lower cholesterol, and reverse a variety of other metabolic-health conditions. In this effort, we also work together to reverse conditions that cause uncomfortable symptoms like those associated with gastrointestinal reflux (GERD), polycystic ovary syndrome (PCOS), fatty liver disease, sleep apnea, joint pain, and many other common health conditions.

I will use the term *metabolic health* frequently in this discussion of weight loss and health improvement, so let's define it. Metabolic health can be defined as an optimal level of weight, waist circumference, blood sugar, cholesterol, and blood pressure. A few other health parameters can be considered as well, as we will discuss later. Integral to the term *metabolic health* are the issues of both diet and activity, how we process the food we take in for energy, and how we expend that energy based on our activity. Metabolic health is important because it is directly associated with the risk of such serious conditions as diabetes, stroke, peripheral vascular disease, and heart attacks. It also relates to less serious but symptomatically bothersome afflictions like the esophageal reflux, fatty liver disease, sleep apnea, PCOS, and the musculoskeletal pain I mentioned earlier.

The opposite of metabolic health is metabolic syndrome, a common condition in the US adult population. As you probably have already concluded, metabolic syndrome is defined as the presence of overweight/

obesity with increased waist circumference, high cholesterol, high blood pressure, and high blood sugar. It is estimated that up to 85 percent of US adults have at least one of these metabolic-health problems, and up to a third have full-blown metabolic syndrome.



*Typical body habitus of male and female metabolic syndrome patients. Metabolic Syndrome includes being overweight, and having high blood pressure, high blood sugar, and high cholesterol.*

I believe that, to stay out of the ER, the two most important things people can do is to maintain a healthy weight and keep their blood glucose in a normal range. If only it were that easy. My goal in writing this book is to share with you the information and techniques that will make you successful in reaching both those goals.

## **BUT I TRIED THAT ALREADY**

Yeah, you probably have already tried a lot of different tactics and plans to lose weight and be healthier. You've read all the books, listened to all the

podcasts, and watched all the videos. And you think to yourself, *If only it was as easy as they make it sound.*

But what if it *could* be easier? What if you made an effort related to diet or exercise and received immediate feedback on that effort? What if you did this as part of a process—maybe not as easy as the diet promoters claim but with something you can see working with your own two eyes in real time? The changes you’ve been trying to make for years become real at last, and you feel optimistic about your health. You try to lose five pounds over a few weeks, but you lose seven instead. Your knee hurts less. Your reflux starts to resolve.

Even better, it’s not just the weight. Other indicators change too. Cholesterol, triglycerides, blood sugar, blood pressure, and other objective health parameters—the same process you are pursuing improves those other bothersome numbers. And though it requires some real effort, it’s easier than you expect.

## MEASURE, THEN MANAGE

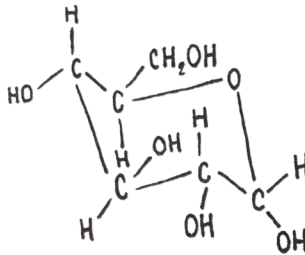
You’ve heard the saying “What gets measured gets managed.” The new, data-driven method you’ll discover in this book is different from getting lab work done every six months or getting an occasional body fat percentage test. While there is nothing wrong with doing those things, too many people do them long after a problem has progressed, leaving them much less time to make effective changes. What if you had concrete data to act on a potential problem earlier on? Because without data, issues can progress for years and are also more difficult to reverse. Even worse, the usual variables (like your weight or an annual blood-glucose test) don’t tell you the exact cause of your problems. Even your doctor sometimes can’t explain the basic issues or how to fix them. And the years go by without improvement.

The risk of you ending up in the ER with one of those health crises that are all too common goes up progressively. The fact is, you can’t properly manage what you’re improperly measuring or not measuring at all.

What number brings thousands of people into my emergency room every year? *That’s* what must be measured. And it is the piece of clinical data

responsible for the majority of obesity and vascular disease in this county and around the world.

That number is blood sugar, also called blood glucose. Blood glucose is the main fuel for the body. The vast majority of carbohydrates you eat get broken down in the intestine and then are absorbed as glucose to provide the energy your body craves. Therefore, when you eat carbs, your blood glucose goes up. To handle all this loose glucose, the pancreas releases a hormone called insulin to guide the glucose into the body's cells so it can be used for energy. So far, so good; that's what our bodies are meant to do.

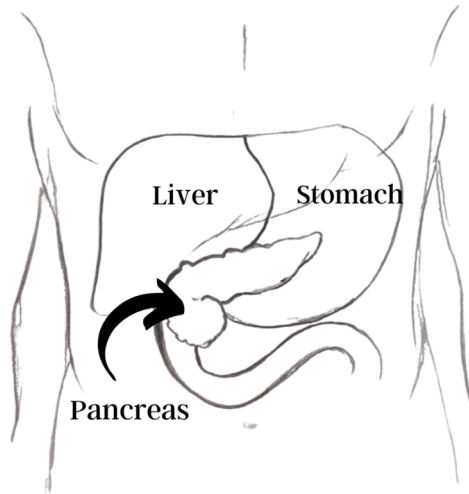


*A blood glucose molecule. The terms blood glucose and blood sugar are synonymous. Blood glucose is the preferred energy source of human tissue.*

However, problems arise when there's too much glucose in the blood. When excess glucose can't be absorbed by all the body's cells, the pancreas puts out more insulin to try to force it all in. If the organs still don't take it in—and they can only take in so much—the result is higher-than-normal blood glucose and an issue called insulin resistance. The organs, like our muscles, are “resisting” the insulin signal to take in more glucose. They have all they need; they are full relative to glucose, they can't take in any more.

By the way, the pancreas, located in the mid-upper abdominal area, has two primary functions. One is to produce the digestive juices, or enzymes, that are squirted into the small intestine to help break down our food.

The other is to produce insulin. It is the latter function, the endocrine function of the pancreas, we will focus on in this book.



*The pancreas is located in the upper mid-abdominal area, just below the stomach. It creates and secretes into the blood the “master controller” hormone insulin.*

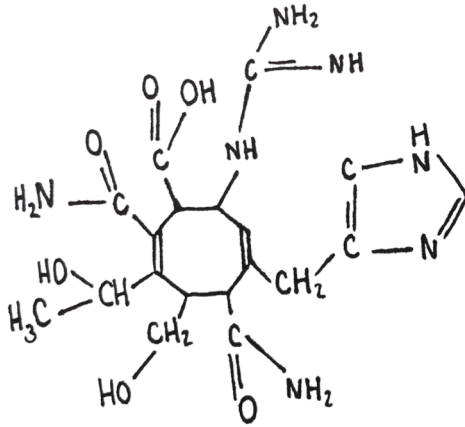
## **RESISTANCE TO INSULIN IS THE PROBLEM**

Why is insulin resistance a problem for most overweight people, even if they don't yet have diabetes or other insulin-related issues? How can improving blood glucose achieve all the healthy outcomes you've been working so hard to obtain?

It's because insulin is the master controller of digestive metabolism and energy storage. And your blood sugar ultimately depends on how much insulin is in your system and how it is being utilized. Insulin allows your organs to absorb glucose from the blood and get energy. But it also directs the storage of excess blood glucose for future use. Insulin regulates the storage of glucose as glycogen (a large, complex glucose molecule).

Think of glycogen as large chains of glucose molecules wrapped into a bundle. Glycogen is primarily stored in the liver and muscle as a source of energy to be used later. But sometimes the need for that stored energy as glycogen never comes because blood glucose remains persistently high.

If this is true the muscles and other organs constantly have an adequate supply of glucose from the blood and rarely need to tap stored glycogen.



*An insulin molecule. Insulin controls digestive metabolism, energy use, and energy storage.*

As the master controller, insulin coordinates the conversion of glycogen to fat as well. Yes, the visceral fat that gets deposited around our midsection. This visceral fat results from excess blood sugar being stored as glycogen and then being converted to fat in the liver. Excess blood glucose also prevents fat from being utilized as an energy source for the body's organs, further supporting that fat accumulation around the waist. In healthy individuals, insulin keeps blood glucose from getting too high (hyperglycemia) or too low (hypoglycemia). But too much of it—the result of excess carbohydrate ingestion—results in fat storage and weight gain. Our ancestors needed that fat storage process more than we do today. They had periods of food scarcity: for example, during times of famine or when the hunt for food was unsuccessful. They needed that extra fat to get them through hard times. We need that extra fat much less today. And, of course, in modern times, that extra fat leads to many of the diseases we have already discussed.

Consider a bear's hibernation cycle. In the fall, the bear spends nearly all its time fattening up by eating roots, berries, and other plants high in carbohydrates. As the bear's blood glucose elevates, the excess glucose is converted to glycogen in the liver, then the glycogen is converted to fat.

The fat is deposited in the bear's midsection. It is this fat that will be the bear's nearly sole source of energy for the many months of hibernation. During hibernation, this fat is broken down to fatty acids to supply energy to the bear's organs. (Without carb ingestion in the winter, blood glucose is much more scarce during this time.) What happens during hibernation? The bear loses weight as it burns fat for energy. It is this process we humans need to replicate if we want to lose weight. We need to create a relative lowering of blood glucose so our body turns to fat as an energy source. As body fat is broken down to provide fatty acids as a source of energy to our organs, we, like the bear, will lose weight.



*A bear in the fall with increased visceral fat as a result of gorging on roots and berries, a hibernating bear using fatty acids as its primary energy source, and a slimmed down bear after emerging from hibernation in the spring.*

In essence, gaining weight is not just an energy balance issue. It is not strictly or simply a first law of thermodynamics issue. (Remember that law from physics class: “Energy is neither created nor destroyed.”) It is not as simple as “calories in, calories out.” I believe it is much more complex than that. It is largely a hormonal issue. And, by far, the most important hormone in play is insulin.

In people with Type II diabetes, insulin levels are usually very high. This is especially true in the early and middle stages of the disease. This is because the muscles have become so saturated with glucose that they can't absorb any more. But the pancreas is still working hard to try to force that glucose into those organs by making and releasing even more insulin. Because the pancreas is now producing excessive levels of insulin at all times, it may eventually become worn out and unable to make the amount of insulin that is needed. This is what occurs in the latter stages of advanced



Type II diabetes. In this situation, the blood glucose rises to a dangerous level unless insulin is introduced from the outside. This is why diabetics need insulin shots to survive. Even before the pancreas wears out completely, when a diabetic is still producing some insulin, additional insulin (supplied by injection) is often needed to help try to overcome insulin resistance.

This book focuses primarily on the early and middle stages of insulin resistance, when intrinsic insulin levels are still high. It is these stages of insulin resistance that are most common and are occurring in the majority of prediabetics and diabetics. This is before the endocrine function of the pancreas wears out completely. (The final stage, when the pancreas cannot produce adequate insulin, is typical of only very advanced diabetes.) Diabetics with moderate disease may need supplemental insulin simply because they have extensive insulin resistance, not because their pancreas has completely burned out. They need extra insulin to help overcome insulin resistance and keep their blood glucose in check. We will later discuss how patients with mild and even moderate insulin-dependent diabetes can achieve reversal of insulin resistance, even to the point at which many can come off insulin completely. I've seen this with a handful of my patients and talk to other metabolic-health doctors who see this not infrequently as well. When the need for insulin is removed, these patients basically can achieve a period of years in remission of their diabetes.

As an aside, when we refer to the condition of diabetes in this book, we are always referring to Type II diabetes. This condition is also referred to as "adult-onset diabetes." Type I diabetes, or juvenile-onset diabetes, has a completely different origin, usually affecting children or teenagers. Its origin is a pathological condition resulting in a deficit of insulin right from the onset of the disease. So this lack of insulin is the result of a primary pancreas problem in young people, not insulin resistance. In Type I diabetes, the pancreas usually stops producing insulin completely. Over 90 percent of diabetics in the US are Type II diabetics, so this is by far the more common type of diabetes and the focus of our discussion.

Back to the issue of insulin resistance, weight gain, and weight loss in adults. Because of insulin's role in weight gain, a critical goal of weight loss should be to control blood glucose and lower intrinsic insulin levels through diet. A key concept of this book is that nondiabetic people—those with no

blood-glucose problem (yet) and prediabetics—can, like diabetics, control their level of insulin release with diet.

That is, they can manipulate the level of insulin release with relative precision based on the food they eat. In doing this, they can then avoid the onset and progression of insulin resistance.

To review, your insulin spikes when you eat carbohydrates. This is because carbohydrates being absorbed in the intestine have caused your blood-glucose level to go up. If insulin levels remain high for too long, insulin resistance results. Insulin resistance causes extra blood glucose to go to the liver, where it is converted into glycogen. Some of that glycogen is then changed into fat. Weight gain is the result.

It may sound strange, but your body wants you to be fat! Again, from a genetic and evolutionary standpoint, increased fat stores conferred a higher likelihood of survival during periods of food scarcity or famine. For your ancestors, being fat was an advantage, so you are physiologically programmed to store and hang on to fat. What was once an advantage is now a liability, putting you at risk for metabolic disease.

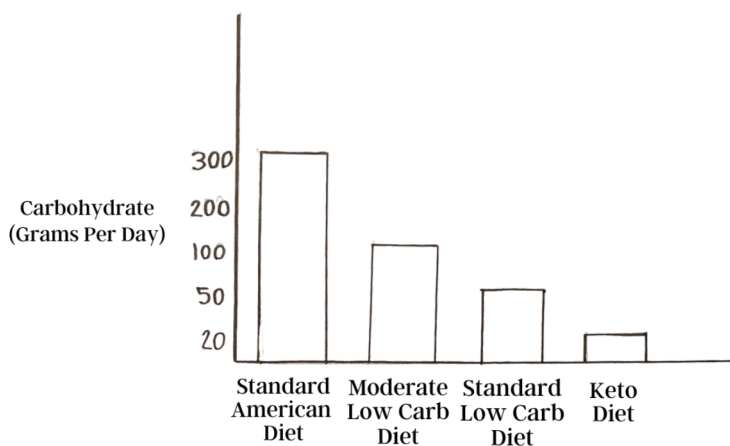
The typical American diet consists of about 300 grams of carbohydrates per day. I believe that to keep blood glucose and insulin low for the purposes of maintaining or losing weight (and avoiding prediabetes), a healthy person should limit their carbohydrate intake to much lower levels. Though the exact number is controversial, with the exception of people with a low body-mass index (BMI), I believe, in general, no one (unless they are trying to gain weight) should consume more than about 125 to 150 grams of carbohydrates per day. (As we will discuss, this number needs to be much lower for most people seeking to lose weight.) My recommendation is in contrast to the US Department of Agriculture's recommendation for the daily allowance of carbohydrates. The USDA recommends between 225 and 325 grams of carbs per day for a person on a standard 2,000 calorie per day diet.

As noted, underweight people are an exception to my low carb intake recommendation. Athletes, people doing fitness training, and people trying to build a lot of muscle mass are also exceptions. These groups burn a lot of energy pursuing these activities, and for some of these enthusiasts, the goal actually is weight gain (e.g., body builders).

A lot of what we talk about in the coming chapters is that people attempting to lose weight need to limit consumption of carbs to a lower targeted number of grams each day. We don't need to be like the hibernating bear consuming no carbs, but most of us do need to aggressively limit carb intake to be successful in our weight-loss efforts.

Before the food pyramid was created in the 1970s, the carb intake of the American diet was much lower. However, since we were first told to reduce our fat intake and eat more carbs, the percentage of carbs in our diets has risen dramatically.

Dietary intake can be broken down based on the percentage of each of the three different macronutrients that are consumed: carbs, fat, and protein. The typical American diet today consists of about 50 percent carbs, a standard low-carb diet is about 15 to 20 percent carbs, and a very low-carb or keto diet is about 5 percent carbs. Consider these approximate percentages, as they can vary a bit.



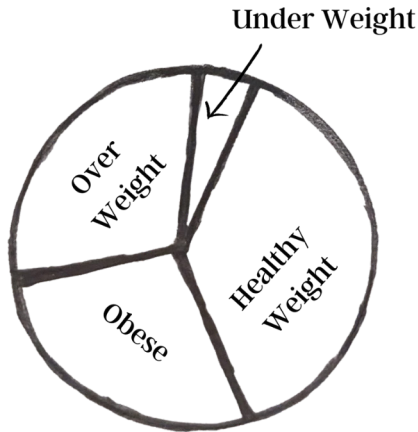
*Relative grams of carbohydrates ingested as part of the Standard American Diet ("SAD") and various other low carb diet regimens.*

Because knowing the level of insulin resistance is so very important in putting a diet plan together, I measure insulin levels on all my patients. This allows me to precisely calculate their level of insulin resistance. This is something most primary care doctors do not do but something I and most metabolic-health doctors feel is very, very important. People with

high insulin levels should restrict their carb intake substantially, often to 50 grams or less per day. A target of 35 to 50 grams per day is not unusual.

This is a level at which many of my patient treatment programs begin. These lower levels are often necessary to achieve meaningful weight loss. Once blood sugar, insulin, and weight goals have been met, carbohydrate restrictions can sometimes be loosened a bit.

People with insulin resistance can produce many times the normal amount of insulin as a result of their organs having stopped responding to the insulin being produced by their pancreas. Because blood sugar remains high in this situation, the body never gets a chance to burn any substantial amount of fat. Insulin levels, of course, stay high then too. The goal of a low-carb diet is to reverse this process.



*Relative percentage of American adults who are obese (BMI > 30), overweight (BMI 29.9 to 25), normal weight (BMI 24.9 to 18.5) and underweight BMI < 18.5.*

Because about 60 percent of American adults are overweight or obese, the majority of those individuals have some form of insulin resistance. For the reasons we've discussed, insulin resistance causes weight gain. It also makes weight harder to lose. That resistance makes it hard to burn fat and can lead to even more fat storage, which leads to even more insulin resistance. It's a vicious cycle.

But obesity, diabetes and vascular disease aren't the only dangers caused by insulin resistance. Elevated insulin can also cause:

- High cholesterol, which leads to artery narrowing from plaque buildup (atherosclerosis).
- High triglycerides. Like high cholesterol, triglycerides are an additional fat in the blood that leads to artery narrowing.
- Elevated testosterone in women and reduced testosterone in men. Such hormone imbalances can cause facial hair in women and reduced vitality in both sexes.
- Increased blood pressure.

As an aside, the good news is that as insulin resistance is progressively reduced, weight loss becomes progressively easier.

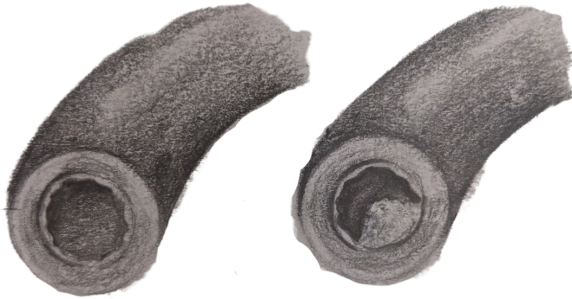
A secondary result of insulin resistance and weight gain is many, if not a majority, of these common ailments:

- Fatty liver disease
- Gastric Reflux (also known as GERD or Gastroesophageal Reflux Disease)
- Sleep apnea
- Polycystic ovary syndrome in women
- Joint and back pain (related to excess weight)

A word about plaque buildup in the arteries, or what is known as atherosclerosis. This process results from inflammation of the blood vessel wall. High cholesterol does play a role, but often, the inflammation of the artery lining begins because of high blood glucose. I believe high blood glucose is a bigger issue related to atherosclerosis than high cholesterol for most overweight people. This is certainly the case for diabetics and possibly for prediabetics and even people with just early insulin resistance. This arterial inflammation and blockage does not occur only in larger arteries. It also occurs in the very small vessels called capillaries. Evidence of high blood sugar playing a role in capillary damage is the kidney failure and peripheral neuropathy many diabetics must endure. These patients may even have low cholesterol, but their small blood vessels have been attacked by inflammation caused by persistently high blood glucose.

To be clear, cholesterol matters for many people. I am not dismissive of the role it plays in the development of vascular disease for some people. I do not think cholesterol numbers should be entirely ignored.

I believe statins (cholesterol lowering medications) like Lipitor are appropriate for some patients. However, again, for most overweight people, insulin resistance plays a bigger role than cholesterol in the development of vascular disease.



**Artery with No  
Plaque**

**Artery with Plaque**

*Atherosclerosis is the buildup of plaque in the artery lining, which may eventually cause complete obstruction of blood flow. This can happen in both large arteries (for example, coronary arteries) and small arteries (capillaries).*

Insulin resistance also promotes weight gain by causing hunger. As more insulin is released in response to carbohydrates, insulin can overshoot the mark and take away too much glucose. This sudden drop in blood glucose triggers hunger. Even if you ate a bunch of carbs just a few hours ago, when your blood glucose dips, you may become hungry again. Even if your blood glucose does not drop into an actual hypoglycemic range, just the rapid change in blood glucose from high to low—something called glycemic variability—can cause hunger. Eating more food in response to this blood glucose roller coaster, of course, results in further weight gain.

Elevated insulin also prevents the breakup of fat into fatty acids. These elevations also result in the increased deposition of visceral fat. Remember, higher insulin promotes fat storage.

So all these factors are reasons why knowing your blood glucose in real time, 24-7, can make a huge difference. But how do you gain access to that critical information?

Through an exciting, proven, and user-friendly technology known as **continuous glucose monitoring**, or CGM for short. (In this book, we will

use the acronym CGM to identify both the process of continuous glucose monitoring and the device that allows that process, a continuous glucose monitor.)

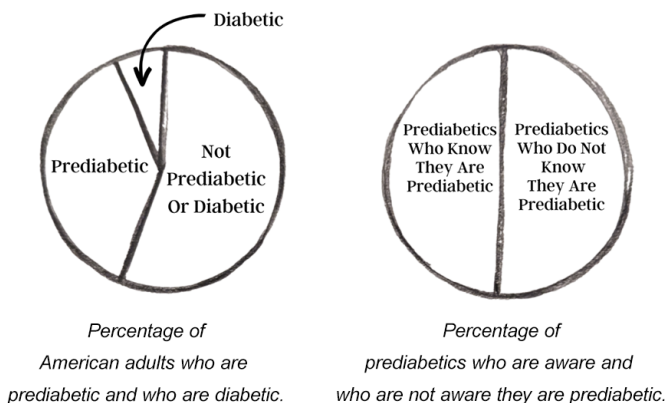
## THE CGM REVOLUTION

CGM is a revolutionary technology that is changing the way people address and improve many health issues and lose weight. I understand this statement is bold, but I believe it is accurate. In my practice, CGMs are an instrumental tool in improving my patients' health and lives.

CGMs allow you to keep track of blood glucose constantly. Right now, CGMs are reserved primarily for diabetics to coordinate insulin dosing (at least based on insurance reimbursement criteria). However, this technology can be extremely useful to other individuals who want to improve their health, prevent disease, and lose weight. With a CGM, you can see your blood-glucose levels in real time. This lets you see how the food you eat is affecting those levels, your weight, and your health.

Currently 10.5 percent of US adults are diabetic, while another 32 percent are prediabetic. By the way, half of prediabetics do not know they are prediabetic! This, to me, is an amazing statistic. Seventy percent of prediabetics go on to develop diabetes. The process that results in prediabetes—insulin resistance—is present in most people years before prediabetes is even diagnosed. CGMs can provide an early warning that insulin resistance is present, well before fasting blood glucose or hemoglobin A1C becomes elevated.

With a CGM, a filament electrode just under the skin measures blood glucose day and night. This filament transmits information in real time to a cell phone app, where the data can be reviewed by the device's user. If the user chooses, this data can also be reviewed remotely by their medical provider or nutrition coach. All my patients have selected the option of allowing me to review their data remotely. It allows me to give them feedback on how they are doing related to their diet.



CGMs must be prescribed; they're not available over the counter. When a CGM is prescribed to a nondiabetic, it is being prescribed "off label." This means the FDA has not approved CGMs for nondiabetic users. However, it is not uncommon for FDA-approved medications and devices to be prescribed off label by doctors. A common example is the drug gabapentin (Neurontin) being prescribed for pain, when it is actually FDA approved only as a treatment for seizures. Gabapentin is prescribed much, much more commonly off label for pain than for its approved indication of seizure treatment.

The CGM monitor (also called a sensor) can be self-applied in five minutes. It then takes just a few more moments to link the device to a smartphone app. Patients can apply the sensor at home to their arm on their own, and each sensor must be switched out for a new sensor about every two weeks. The application of the device to the skin is nearly painless, and the person wearing the sensor is usually unaware of its presence, except for the valuable blood-glucose information being made available to them. In my practice, we guide patients through their first sensor application either in the office or by telemedicine. After that, they are good to do it on their own.

Currently, there are three CGM devices on the market in the US. By far, the brand most commonly utilized by nondiabetics is the Freestyle Libre CGM, manufactured by Abbott. This is this device that I prescribe most often for my patients.



## WHY CGM WORKS FOR WEIGHT LOSS WHEN MOST OTHER METHODS FAIL

With a CGM, you can get data-driven diet guidance based on your actual eating patterns. You are able to see in real time how the food you eat affects your blood glucose. Instead of getting blood work done every six months or yearly, you receive feedback within minutes and can change eating patterns based on this data.



*Continuous glucose monitor on the arm of a user. CGMs are applied painlessly to place a tiny filament sensor under the skin which provides 24/7 real time blood glucose readings.*

I have found that self-monitoring of blood glucose and the eating guidance this process provides can help tremendously with weight loss. Because blood sugar levels have such a close association with weight gain and weight loss, the CGM provides a detailed eating map. It guides my patients in switching from glucose as an energy source to utilizing fatty acids as an energy source. Remember, when fatty acids are the primary energy source for the body's organs, weight will be lost. This self-guidance helps with reduction of fat stores and maintenance of weight loss once those fat stores are reduced. Managing blood glucose closely also helps address metabolic-health problems such as prediabetes, high cholesterol, and hypertension.

Like its frequent companion obesity, unhealthy blood-glucose levels cause many metabolic problems.

All these results are possible because the guidance provided by a CGM doesn't rely on subjective measures. No one's guessing if this or that will raise or lower your blood sugar. You can see it right in the app on your cell phone. You don't have to guess what is going on with your energy metabolism because you can see which foods spike your blood sugar and which foods don't.

And, best of all, you can focus on how the specific foods you eat affect your individual metabolism. You do not need to rely on the comments or well-meaning insights of another person who might say, "I ate more of this food and avoided that one, and I lost weight," or "I went on this diet plan and lost twenty pounds." The fact is your metabolism is largely unique to you, and the approach you require to manage it may be different than that of a friend, a family member, or even the majority of the population. You also don't know precisely what actions another person has taken to get the result they achieved (e.g., what fasting intervals or what exact workout regimen). Or if that plan will get you the same results. It is said that anecdotal experiences can be lies because they often leave out all the other variables and details. But with CGM, you see your numbers go up, go down, or stay steady; there's nothing subjective about that. The CGM tells you your individual truth, at least concerning your blood glucose and what dietary approach will work best for you individually. You can see it in your personal data.

The benefits of CGM are not just claims; here are examples of real patients I've worked with in my clinic:

When I had my first telemedicine appointment with Benjamin (fifty-eight years old and 5'8") he weighed 245 pounds. His blood sugars were initially bumping into the prediabetic range. But after utilizing a CGM for six months, we lowered his blood sugars to a normal range, and he reduced his weight to 180 pounds. Instead of three full meals a day and frequent unhealthy snacks, he now eats two well-balanced, healthy, low-carb meals a day. I reviewed his CGM data remotely to provide him guidance.

Sharon (sixty-four) used to get frequent headaches and periodically felt lightheaded. Blood-glucose spikes of 200 mg/dL were not uncommon for her. And blood sugar “variability” (spikes followed by severe drops) was found to be contributing to her symptoms. After using a CGM, she cut out most sugar and dropped her carb intake to about 50 grams per day. In four months, she lost twenty-seven pounds. Her headaches and light-headedness are now nearly a thing of the past. Spikes over 150 mg/dL are now very rare for her. Based on feedback from her CGM, she is now also largely avoiding processed foods. What she eats fills her up, and the cravings she previously experienced just a few hours after a low-quality processed-food meal are nearly gone. While weight loss got her in the CGM door, the benefits to her health keep her using the CGM.

Amy (forty-eight) learned to monitor her glucose levels and follow a low-carb diet. Her initial health concerns included not only her weight but also chronic fatigue. She shed twenty-eight pounds and kept it off. Her routine labs now reveal a much better health status, and she has much more energy. She describes the constant availability of her CGM data and her periodic visits with me in which we review her data as “life changing.” (I don’t take credit for this, but I share my patients’ joy when they have such meaningful results.)

Tess (fifty) had a significantly abnormal lipid profile, but her continuous glucose monitor helped her follow a diet that improved her overall numbers. As is not uncommon when switching to a low-carb diet, her triglyceride levels dropped moderately, and her HDL (good cholesterol) went up. Her cholesterol also dropped about ten percent. Losing thirty-five pounds and keeping it off has been very self-reinforcing. Encouraged by her experience and now less apprehensive about going to the gym, she has added regular workouts to her health regimen.

Notice that the word diabetic did not appear in any of these brief patient scenarios. Continuous glucose monitoring, I believe, should be a tool for everyone who can benefit from it.

This being said, I have used CGMs to help lower medication needs in both nondiabetic and diabetic patients (including insulin needs in diabetics). Don't get me wrong; these scenarios make the point that CGMs are great health improvement tools for nondiabetics, but diabetics can also take advantage of the weight loss and health improvement benefits offered by CGMs, even if they are not on insulin. Many diabetics, some on insulin and some not, come to me having never tried a CGM.

In one of the scenarios above, we talked about Sharon's blood-glucose level of 200 mg/dL. The *mg/dL* is the standard unit to describe blood glucose: milligrams per deciliter. We will talk about glucose numbers a lot in the following pages. However, I am going to utilize only the digits for these discussions. Understand that if I indicate a blood-glucose level of 150, I mean 150 mg/dL.

## MORE THAN A “DIABETES ONLY” TECHNOLOGY

To emphasize the point, CGM is most commonly currently prescribed only to insulin-dependent diabetics. My treatment plans offer the great benefit of this technology with the majority of my patients being overweight or metabolically unhealthy, but without diabetes. The device can help patients avoid becoming prediabetic and, ultimately, even prevent a prediabetic from ever becoming diabetic. Prediabetes is 100 percent reversible in most patients. (Diabetes is not completely curable, but as we previously discussed, CGMs can be used to help put diabetes in remission.) Why wouldn't we want to offer the benefit of this technology to all these groups? Some skeptics may assume that CGM would be a waste of time for nondiabetics. However, most of my patients, once they experience a CGM, wonder why their doctors have not previously recommended it to them.

Reasons for this lack of recommendation include not only that CGM is thought of as being for diabetics only but also that the technology is somewhat new. That's a relative term—the technology has existed for at least fifteen years—but it isn't well known outside the diabetic community.

There is no question that, in general, the practice of medicine (diagnostic and treatment approaches) changes very slowly. So some people have the impression that this technology may be untested. But it is tested. All that's new is its application as a diagnostic and therapeutic tool for diabetics not on insulin, for prediabetics, and for overweight nondiabetics.

I believe CGM use for nondiabetics should be on your doctor's radar. In my opinion, never has a wearable technology had the potential to bring so much value to so many people. Pulse readers, oxygen saturation monitors, and step trackers are nice, but they do not hold a candle to a CGM and the valuable, potentially life-changing data this device can provide.

And CGM has only gotten easier to use over the last ten years since new systems and technological improvements have refined these devices. For example, CGMs originally required calibration but no longer do. They work out of the box. Diabetic patients swear by the technology that spares them from pricking their fingers four times a day. They can see their glucose levels instantaneously on their phones. Since they have more control over their blood sugar, they have more control over their diabetes. And, quite honestly, more control over their health and their lives.

I strongly believe it's not only diabetics who should benefit from this device. CGMs should be embraced by physicians for their patients who are overweight, prediabetic, or likely have insulin resistance. This latter group includes most overweight American adults.

I am not diabetic, and I do not currently have insulin resistance, but I first used a CGM myself several years ago. I continue to use one to make sure my diet stays on track. (I do admittedly occasionally take a CGM "holiday" that is, a period of time without a CGM. We will discuss CGM holidays in detail in a later chapter.) Continuous blood glucose feedback helps me make smarter food choices. The device originally helped me lose weight, and it has helped me keep that weight off. With diabetes in my family, it also helps me stay vigilant regarding my potential risk of insulin resistance and even prediabetes. Controlling my blood glucose boosted my energy levels and my mental clarity. (One cause of brain fog is glycemic variability.) Based on my personal experience with the device, I chose to extend CGM use to patients who wanted to lose weight and improve their health.

The result for the vast majority of my patients has been significant weight loss and much-improved metabolic health.

Many of my patients have found success losing weight and improving their metabolic health for the first time with this continuous feedback. They also are often seeking to fight off the serious medical problems that can befall the overweight and the metabolically unhealthy with increasing age. By keeping their blood sugar and weight within optimal ranges, they are slashing the likelihood of kidney failure, vascular diseases, and the other major health issues that threaten the majority of people who are overweight and have insulin resistance. Along the way, they feel better, have less fatigue, and tame other significant medical problems like fatty liver disease, sleep apnea, PCOS, and gastroesophageal reflux (GERD). With weight loss, even arthritic and joint pain often improves.

I want my patients to feel better, and have more energy and better mental clarity. I also want them to avoid the myriad of maladies associated with excess weight and high blood glucose... and, ultimately, I want them to stay out of the emergency department.

## **KNOW YOUR NUMBERS, CHANGE YOUR LIFE**

Later in this book, we'll explain how the near-real-time feedback from a CGM is used to make necessary diet and lifestyle adjustments. We'll remove the guesswork associated with most diet programs and provide you with objective measures to guide improvement in your health. Forget about trying to figure out if a given food will help you achieve weight loss and better health based on gut feelings and internet research that may not apply to you. With a CGM, you'll know for sure.

But can't your doctor just advise you on what's nutritious and what isn't? That's an issue. Most doctors aren't experts on nutrition. They spend only a few hours on it in medical school. (I know that for sure; I was there.) Additionally, your doctor is almost certainly too strapped for time to implement a comprehensive CGM program for you. That's why the prescribing of CGMs to nondiabetics, along with the implementation of a complete metabolic-health improvement plan to go with it, isn't more common.

Which is a shame because CGMs work best when used with the supervision and guidance of a knowledgeable medical provider. Such a collaboration involves commitment and accountability on the part of both doctor and patient. The doctor needs to first complete a full metabolic-health assessment. Then they need to follow your data remotely and provide nutritional and activity guidance based on the CGM data. Unfortunately, though most primary care physicians have the best interests of their patients in mind, they just do not have the time and expertise to implement such a program. This would add to overworked doctors' already full workloads and tight schedules. With everything else they must do, most doctors lack the time to give this process the attention it requires. Unfortunately, their limited time with their patients is often dominated by treating disease, not preventing it. They are relegated to providing "disease maintenance" and have little time for disease prevention and reversal.

As their time is dominated with managing hypertension, high cholesterol, and other chronic conditions (and prescribing medications, making dosing adjustments, etc.), nutritional and lifestyle guidance is often not addressed adequately. As you probably well know, there seem to be precious few minutes to address disease prevention in those once-yearly or once-every-six-months visits you have with your doctor. This is why nutrition is not a normal part of routine primary care visits. Though the doctor is paying attention to your medical conditions, you're one of many patients. The doctor is likely very good at addressing your pathology with medication management but may not be very helpful in reversing the root causes of your health problems. A discussion of the root causes of hypertension or high cholesterol is seldom addressed in a twenty-minute visit. This is why it is necessary for you to take nutrition, diet, and lifestyle changes into your own hands. CGM, with the support of a knowledgeable metabolic-health physician, can get you on the right path and keep you there.

My metabolic-health practice complements but does not replace a patient's primary care physician. Nearly all my patients' primary care providers are grateful to me for providing this added support to their patients. It is almost like a burden has been lifted from them. They know their patient is now being supported with an effective metabolic-health program, one that they themselves do not have the time (and sometimes the

expertise) to provide. They are happy to see their patients' health improve because of weight loss. And are really happy when that patient no longer needs a previously prescribed medication for hypertension, high blood glucose, or high cholesterol.

I truly believe it's unfair to keep CGM access from nondiabetics. This technology is too valuable to hide from people when it could, in the long run, dramatically improve their health or even save their lives. CGMs give patients an early warning of the presence of insulin resistance—maybe even many years before they become prediabetic. The patient receives critical information while there's still time to prevent illness. It's an opportunity for change they would very likely not otherwise experience. As alluded to, most primary care providers are in the business of treatment and disease management, not prevention. CGMs within a structured program offer many patients an opportunity for prevention and disease avoidance.

But early warning isn't enough. You have to take action. It's like the smoke detectors in your house; when one goes off, you're warned about the fire, but you still have to exit the building and call the fire department. By having a smoke detector in your home and heeding its warning, you have taken preventive action, and most often, any significant fire damage is avoided. However, if there is no warning and no alarm, by the time the firemen arrive, the house might be damaged beyond repair or, worse yet, burned to the ground.

Managing your health is similar. Even if you get an early warning, if you do nothing, you'll likely still progress to chronic illness. Depending on how long you wait to act, the damage from disease may be irreversible. You could be in deep metabolic-health trouble or, worse yet, end up in the ER in crisis. It is true that an ounce of prevention (especially related to early insulin resistance detection and management) is worth a pound of cure.

I experienced a house fire once. The alarm system did not work. Everyone lived, but the house burned down. Just as it's better to detect a small fire and get it put out before the house is engulfed in flames, it's better to prevent chronic illness before its onset and progression. Prevention is preferable to having to endure the symptoms and risks of that disease and require lifelong medical management of it.



## WHAT THIS BOOK IS *NOT* ABOUT

At this point, you probably have some sense of where this book is headed. But maybe you have concerns that CGM may not be for you, or you need to talk to your family physician before reading further, or you need to consult Dr. Google. So, to address any lingering questions or concerns about whether you need a CGM or if it is right for you, let's cover what this book is *not* about.

It's not about super fine-tuning health for someone who is already very healthy. It is not for the twenty-five-year-old gym rat. Young healthy people do use CGMs for this purpose, and they are useful to them, but that is not the purpose of this book or the population I want to reach. This book is not about super optimizing or maximizing your gains in the gym. There does exist a group of young "techie" who have adopted CGM to optimize health and gym workouts or take their BMIs from 23 to 21. Again, that is not my target audience.

I am looking to help overweight or obese individuals, those at risk for progressive insulin resistance, and those most threatened by the probability of chronic disease. The fact is that most of my patients are overweight, middle-aged or older people who already have metabolic-health problems or fear that they will soon have them. And that is the population I am most passionate about trying to reach. This book is about improving your health so you can live disease-free for decades and with much less risk related to future illness at any point as you age. Progressively more of this patient population is hearing about CGMs and embracing this technology to change their lives. And it's helping them in a big way. Unfortunately, there is not a lot of information out there on the nuances of using this technology and how to integrate it into a comprehensive metabolic-health improvement and weight-loss program. That is also my purpose in writing this book.

This is also not an advice book that says, "Just do X." You've heard the refrain countless times. *Just eat less. Just exercise more.* Such advice helps no one because good metabolic health doesn't have a simple solution.

CGM can help you, but you have to take action on the data, and that action can't be summed up with "Just do this." The other pieces of a

program—for example, a focused diet, a specific activity regimen—need to accompany the device’s use.

In the ER, I can’t take the clinical diagnostic or therapeutic approach with a patient that works most of the time. I need to be right literally 100 percent of the time, at least related to not missing a serious problem based on the patient’s symptoms. I’ve got to make the right diagnoses and initiate the right therapeutic plan in all the seriously ill patients I care for. I can’t manage patients with life-threatening illnesses with an approach that works most of the time. Suboptimal management resulting in a life-changing poor outcome or, worse, death is not acceptable. Good interventions are based on data: a thorough history, physical exam data, X-rays, lab data, etcetera.

Similarly, I owe it to the patients in my metabolic-health clinic to offer the assistance and insight that result in a diet and lifestyle plan that is nearly certain to get results. I can’t give the typical diet guidance that only works for some people some of the time. I need to offer patients a plan that has an exceptionally high probability of working for that individual patient. A careful and complete metabolic-health assessment, CGM data, and an accompanying treatment plan allow me to do that.

“But isn’t that an impossible standard?” you may ask.

No, it’s not. Getting a repeat customer with a worsening problem is the worst thing that can happen to an ER doctor. (Not to mention it is not a good thing for the patient either!) We’re not in the business of routine checkups. If a patient comes back next week with worsening symptoms, it means we likely missed something. When the patient comes in the first time, a data-driven approach helps us to not allow a serious problem to slip through the cracks.

Let’s say an ER doctor sees an average of 5,000 patients a year. Over a thirty-year career, that doctor sees 150,000 patients. An approach that overlooks a serious problem in, say, three patients, who ended up having a stroke, a heart attack, or other fatal condition, in my mind is not acceptable. By the same token, advising ineffective approaches to weight loss or reversing insulin resistance gives patients false hope.

It also could allow disease to progress, resulting in irreversible health issues. (Think diabetic complications like neuropathy or kidney failure or, worse yet, a stroke or heart attack.)

So, in my clinic, seeing and using the data of blood-glucose levels allow for an optimal diet and metabolic-health outcome. Reviewing data constantly leaves little chance that something in the management plan will be missed.

Also, spending years as an emergency physician has taught me to pay attention to human behavior and how people arrive at those behaviors. For example, why did this patient come to the ER? It may not be their isolated medical complaint but something else going on in their lives that brought them in today. For example, did that young female with the black eye get it not from walking into a door like she said but from an abuse situation? Sometimes it is important to dig deeper.

So, in my clinic as well I need to understand a lot about my patients—for example, their home environment, their work situation, and their stress levels. Are they really going to follow the treatment plan we have agreed on? How can I help them address any potential obstacles?

Through these observations of tens of thousands of patients over the years, I've gotten pretty good at understanding what motivates people and how to use that information to help them improve their health.

As a growing number of adults are dealing with metabolic problems, it is becoming increasingly evident that the old way of “just” telling a patient to do something doesn't achieve the outcome sought. Again, offering advice that says, “Just do X” makes no sense. The advice needs to be targeted to the patient based on data, and a CGM helps achieve that. And for a successful outcome to be achieved, the potential impediments to success need to be fully identified and completely understood by both the patient and the physician. And the desired, mutually agreed-upon behavior must be monitored, measured, and reacted to on an ongoing basis.

There is no *just*, not even “Just try CGM.” A patient does not *just* put on a CGM and lose weight. In addition to the CGM, a dieting, fasting, and exercise plan needs to be discussed, understood, and successfully implemented. Only a complete evidence-based, data-driven plan will achieve the desired outcome. A CGM-based plan is evidence-based because all the techniques utilized (e.g., targeted low-carb diet, intermittent fasting, etc.) have been proven effective. However, the components of the plan need to be woven into a program specific to the individual patient, based on their

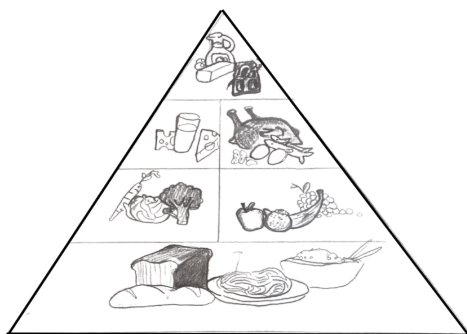
personal data. *Data-driven* means it's measured by hard numbers. And those numbers are day-to-day, even hour-to-hour, blood sugar levels. Success can only be measured by keeping blood sugar in an acceptable range; if it doesn't stay in a range in which the body is tapping fatty acids for energy, it's not going to be successful.

This book also will not tell you what you already know. If you're reading this, you already know some facts about nutrition. You know that all foods are one of three macronutrients: carbohydrates, fat, or protein. You don't need to be told what a carbohydrate is. You already know what a calorie is. You probably even know about the classic food pyramid and why the diets it promulgated resulted in the epidemics of diabetes and obesity that we have today. A detailed discussion of that basic nutritional and historical information wastes your time and doesn't help you achieve the outcomes you need. If you need pieces of that type of information along your CGM journey, you can do a simple internet search. Or go to my website at [metabolicmds.com](http://metabolicmds.com); it's all there. The information in this book assumes some knowledge base related to nutrition. An example is that you probably know all carbs are either a sugar, a fiber or a complex carbohydrate. We will cover some of this type of basic background information limitedly, but this book is for those who are ready to attack their weight and health issues with a more sophisticated, data-driven approach.

As I discuss the benefits of a low-carb, high-fat diet in the coming pages, I would like to offer one historical insight that I believe is undeniable. In the 1970s, the food pyramid was introduced and was widely publicized by both the US Department of Agriculture and the food-processing industry. It has breads, pasta, grains, and other carbs as the foundation of a healthy diet. Fruits and vegetables are just above the foundation, with meats, dairy, and oils near the top. The last groups, protein and fat, were the foods we were told that should be consumed only in very limited amounts.

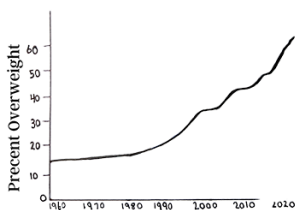
The government's motivation in promulgating the food pyramid was mostly the result of accepting bad science—studies inaccurately suggesting that a low-fat, high-carb diet would reduce heart disease. The food-processing industry's motivation was more financial. Processed foods with sugar, some seed oil, and refined grains taste good (allowing for increased

sales) and have a longer shelf life and higher profit margin than whole foods (e.g., produce, meats, fruits).

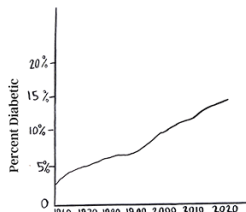


*The traditional Food Pyramid was first published in 1974 by the US Department of Agriculture. It emphasized bread, cereals, pasta, and rice as the “foundation” of a healthy diet.*

The low-fat and reduced-fat food craze of the last fifty years has ironically led to the high rates of obesity, diabetes, and associated vascular illness we have today. In fact, today’s grocery stores, with a myriad of processed foods lining the aisles, are nearly unrecognizable by 1960s standards. At any rate, it is not a coincidence that our continuing epidemics of diabetes and obesity began at the time the food pyramid was introduced.



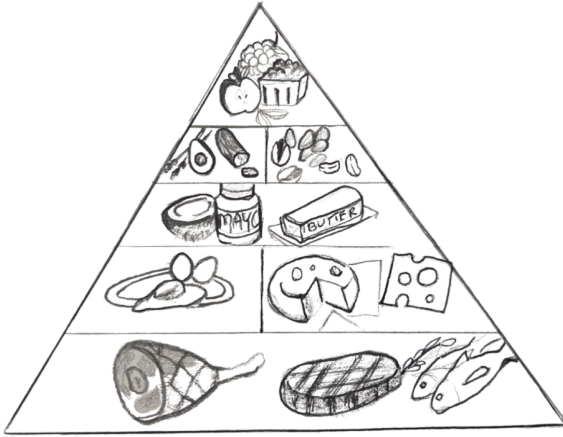
*US prevalence of obesity between 1960 and 2020.*



*US prevalence of diabetes between 1960 and 2020.*

Metabolic-health clinicians and low-carb enthusiasts have promoted an alternative food pyramid. This is a pyramid I support. It has protein (meat, fish) as the foundation and dairy and healthy oils next. Fibrous fruit and vegetables are next, and carbs (bread, grain pasta, etc.), being less important,

are at the very top. (Some versions of this pyramid do not even include such food items as bread, rice, pasta and potatoes.) The low carb food pyramid essentially inverts the traditional pyramid.



*The Low Carb Food Pyramid endorsed by low carb diet advocates. The foundation of this pyramid consists of meat, poultry fish, eggs and healthy Omega 3 oils.*

Back to discussing the value of a CGM-guided diet and the information I will be covering in the subsequent chapters. I've personally and intentionally put myself in your position as part of my efforts to understand what patients need. I've read lots of diet books, both mainstream and alternative. And nearly every time, these books spend fifty to a hundred pages of backstory providing high school-level information on nutrition. It's an exercise in frustration. Many times, I screamed at the author in my head: *Tell me what to do*. I wanted pragmatic instructional guidance, not pages and pages of information that I, and the vast majority of people interested in improving their health, already know.

But it gets worse. Not only are most of these books front-loaded with a bunch of irrelevant backstory, but the author also builds up to some new, life-changing revelation with soaring prose and simple steps. But when you get to the end, it's a letdown. All those promises, all that effort, all that hype and hope, boil down to something you could have googled in far less time for free.

Unlike other dietary and lifestyle guidance out there, this book doesn't assume you have unlimited free time and unlimited disposable income. Too many diet and nutrition advice authors assume you'll make it work somehow, even though you might not have the means. How can you eat an expensive porterhouse steak five nights a week? Regular people can't. They also can't prepare elaborate meals that take hours to cook every day. They have work and family responsibilities. Good nutrition should be available to everyone, not a select few. And the guidance related to a program encompassing that nutritional approach needs to be provided in a manner that can be practically and efficiently implemented.

My private practice, Metabolic MD, takes a pragmatic clinical approach that can be embraced by just about anyone. I see patients of all kinds, just like in my previous ER practice. Moms and dads of working-class families, parents and teenagers from single-parent homes, professionals, young people, old people—I've been fortunate to be able to help them all. The bar for participation cannot be set too high. The plan must respect each person's time limitations, means, family situation, and individual needs.

As for the meals, no expensive steak (or Chilean sea bass) is necessary here. No meals mailed to your door. No shakes you must purchase.

Instead, we provide guidance so that our patients can prepare foods tailored to address their situation. And we understand that food preparation can't take up all your time. I get that there are a lot of other important things going on in your life. Nor do you need expert cooking skills. And you can improve your health and eat right without running up the grocery bill. Good nutrition shouldn't be expensive.

So now that you know what this book won't say and do, let's see what it *will* do.

## **SO, WHO IS THIS BOOK FOR?**

This book is for people who want help right away. Whether you're overweight or prediabetic, have high blood pressure, or have another metabolic-health condition, you do not want to wait months for improvement. You just want to get going and receive help managing your current conditions, symptoms, and situation—without dozens of pages of fluff.

This book is for people who need information to take the right actions. In most cases, you have up to now been left to guess at your blood sugar based on what you eat and drink. Or a once-a-year blood test that really for most people provides limited useful information. You really don't have any idea of your blood-glucose levels or patterns over the course of a day or a week. CGM takes all the guesswork out of this by telling you what your blood glucose is, not just at a given moment but 24-7. By seeing the impact of what you eat on your blood sugar and by tracking daily changes in your numbers, you'll know what's working and what's not.

This book is for those who want a permanent solution based on a proven formula that is simple and straightforward to implement. We're all familiar with the lose-weight-quick boot camps. And the quick-fix diet books with no real medical basis. And we're familiar with how they fail. The problem is that those approaches take up all your thought and time, and they do not create a sustainable lifestyle change. By contrast, the CGM-based solution is easy to implement and keeps on working long term. You'll spend less time being fearful that your diet isn't working and more time knowing that your numbers are guiding you to a successful result. The diet and other habit changes you make will be less stressful and require less effort as they are based on the certainty of data. And these will ultimately lead to permanent lifestyle changes. If the changes you make are not sustainable, what's the point?

This book is for those who care about their metabolic-health future. Those who want to lose weight to maintain good physical mobility into their 80s and 90s. It is for those who don't want to ever have any chance of going on dialysis three times a week or losing a leg to advanced diabetes. These chronic diseases are dangerous, but CGM gives you a way to protect yourself against them. And this book is for those who care about avoiding progressing to the point of an acute health crisis, like a heart attack or stroke. Remember, my goal is to keep you out of the ER, not just this year or next year but indefinitely.

So read on if you want to learn about a new, effective medical technology to help you meet your health goals—maybe the most effective medical technology out there for this purpose. And it's coming from a real-world



ER physician and experienced metabolic-health clinician who understands metabolic disease and has helped thousands of patients just like you.

If you're sold already, please reach out to us. It's best to finish the book first and get your money's worth from these pages. But if you have a major concern, if time is critical and you want a solution right away, don't delay. You can contact my staff at my private practice by going to [www.metabolicmds.com](http://www.metabolicmds.com).

See you in the next chapter.



## CHAPTER 2



### IS CGM SAFE AND EFFECTIVE?

**M**any emergency room patients receive not only a specific treatment during their stay but also a discharge medication—sometimes, unfortunately, even if they may not need one. For example, if someone has a viral respiratory infection, they might push the doctor to provide an antibiotic anyway. The patient is thinking, *Yes, it may be viral, but what if it isn't?* And the doctor, being pressured and wanting the patient to be satisfied with their ER visit, ultimately convinces himself, *What harm can it do?*

I have made it a point to never overprescribe, but often, the general public wants something to treat their condition after they leave the hospital. Sometimes when I don't provide a medication, it means I need to spend a lot of extra time with a patient to explain my thinking. Nearly all prescription medications have side effects, and I don't want my patients being unnecessarily subjected to, for example, a bad medication reaction. Patients need to be educated on the medications they're prescribed. It's the doctor's job to inform patients not just of side effects but of the drug's impact on overall health—and if the benefits outweigh the risks. Sometimes, the side effects of a medication can be almost as bad as what brought a patient to the

ER in the first place! In fact, some ER visits are caused solely by medication reactions.

It's with this perspective that we approach continuous glucose monitoring. When I initially researched CGMs and prescribed them, I did not just assume that because a CGM was not a drug in the usual sense—i.e., it is not an oral consumable, injection, or infusion—that it was 100 percent safe. So let's investigate to find out the facts for ourselves. Do CGMs cause any side effects or untoward consequences? Remember, a doctor's primary goal is "First, do no harm." When I first began to use CGMs for my metabolic-health patients' benefit, it was with this thought in mind.

## **ARE THERE CONTINUOUS GLUCOSE MONITORING SIDE EFFECTS?**

When I prescribe a CGM, I first have patients use the device for a two-week trial period. That's long enough to see if blood glucose curves are flat, high, moderately variable, or very irregular. If the numbers are high, or if there is significant variability, this suggests insulin resistance is present. I learned after just a few months of prescribing them, that a CGM for this two-week diagnostic period has zero downside. Once blood glucose numbers and patterns have been assessed in this initial period, the device will then be used going forward as a guide to diet. The "use after the two-week trial" I consider as a "therapeutic phase," which may last for a number of months or even years. The continued use of the CGM guides my patients so they can target exactly the blood glucose goals they are pursuing.

However, there have been some doctors on social media who warn about "risks" and "potential harms" of CGM use by nondiabetics. Or more frequently, warn that the use of CGM to evaluate blood glucose levels or guide diet is unnecessary. Everyone can consult Google, so anyone can search for side effects. You won't find much downside related to CGMs. Go ahead and search "risks and benefits of CGMs".

In my metabolic health clinic, I maintain an open-door policy regarding questions or concerns associated with CGM use (or any other program approach for that matter). My patients feel free to bring me any questions and concerns about their device. And even if I'm not available (which I am most of the time) a member of my experienced team nearly always is. My

feedback from my patients is, almost without exception, that they embrace and understand the power of this device almost immediately.

That said, let's address the most common critiques of CGM use you might find while searching online, asking around, or posing the question to your primary care doctor.

## THE TOP FIVE POTENTIAL CONCERNS ABOUT CONTINUOUS GLUCOSE MONITORING

### **Concern 1: If you're not diabetic, CGMs are a waste of time.**

One of the biggest criticisms of CGM use is that only diabetics can benefit from this technology; no one else needs it. We briefly discussed this concern in the last chapter. It is the most common concern I've been challenged with (often from other doctors who don't prescribe them to nondiabetics). It's a fair question to ask. Why would you need this monitor if you're not even sick? The question I ask is "how do you know you are not sick" without at least a limited CGM experience. I see plenty of patients who come to see me to lose 20 or 30 pounds, but find during their two-week trial that they are prediabetic, or even diabetic.

A 2019 *New York Times* article discussed a study by JAMA Internal Medicine on glucose self-monitoring for diabetic patients not on insulin. Across 450 patients, the researchers found that there was no negative impact on health-related quality of life with CGM use.

There was no increase in how many times patients experienced hypoglycemia (from a lower carb intake guided by CGM, while taking oral glucose lowering diabetic medications). Nor did the use of this testing necessitate any higher number of patients needing to commence insulin treatment.<sup>1</sup>

In the author's view, routine glucose testing was viewed as an "expensive and unneeded medical procedure."

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1 Aaron E. Carroll, "A Diabetes Home Test Can Be a Waste of Time and Money," *New York Times*, March 11, 2019, <https://www.nytimes.com/2019/03/11/upshot/a-diabetes-home-test-can-be-a-waste-of-time-of-money.html>.

An article published by Harvard Medical School stated that CGM offers no health improvements for nondiabetics, whether overweight or not. That piece considered CGM little more than a novelty for nondiabetics. It further said that more studies were needed to prove any benefit of CGM for nondiabetics.

The article also claims that any drop in blood sugar will be used by patients as an excuse for snacking, which will lead to weight gain. It takes the position that no knowledge is better than “unnecessary” knowledge.<sup>2</sup>

Another article by *Everyday Health* says that “more is not always better when it comes to medical care.” And it, too, claims that CGM is only useful to diabetics.

To some degree echoing these articles, the American Academy of Family Physicians and the Society of General Internal Medicine recommend regular glucose testing only for those using insulin.<sup>3</sup>

All of these publications and associations push the same narrative: “You don't have to worry about a continuous assessment of blood glucose unless you're diabetic and on insulin. Otherwise, CGM is a waste of time and money.”

But they all miss the simple point that prevention is better than developing a condition that requires treatment and then having to work for and hope for a “cure”. I personally would rather prevent a condition, than be subject to the necessity of lifelong treatment for it.

As mentioned, many, many of my new patients come to me because they just want to lose some weight. I discuss with them in detail their motivation and goals for weight loss, and their current state of health. We check their level of insulin resistance and other routine tests like their lipid profiles. We then put a CGM on them for a two-week trial. As I mentioned above, it is not unusual for some patients to find out during this trial that they are in fact prediabetic or even diabetic.

That's vital information to have. Over 85 percent of American adults suffer from some kind of metabolic health issue, but most don't know it.

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2 Robert H. Shmerling, MD, “Is Blood Sugar Monitoring without Diabetes Worthwhile?” Harvard Health, June 11, 2021, <https://www.health.harvard.edu/blog/is-blood-sugar-monitoring-without-diabetes-worthwhile-202106112473>.

3 Shari Roan, “Many Type 2 Diabetics Needlessly Test Their Blood Sugar More Than Needed,” *Everyday Health*, December 14, 2018, <https://www.everydayhealth.com/type-2-diabetes/living-with/many-needlessly-test-their-blood-sugar-home-study/>.

Many patients come to me seeking weight loss, often even more for personal appearance issues more than health issues. Once they see blood sugars in the prediabetic range or higher, or maybe even just numbers with a lot of variability, they realize the issues they face are much bigger than just aesthetics.

A CGM can help them discover their health issues before they become irreversible. It is a fact, as previously referenced, that half of prediabetics don't know they are prediabetic. For many of these patients experiencing a CGM for the first time, it is no wonder they have had previous trouble losing weight—they have insulin resistance! They never would have known this without the CGM trial.

I see a select group of patients. They “preselect” themselves to seek help from me because they are overweight or fear they may have metabolic health problems. Often, they are looking for help for both of these reasons. They know something is wrong and they can do better, but they have not been able to make progress on their own, and usually their doctor has been of limited help. Often, they are making an effort to eat healthy, but they know they are not doing such a good job. Most don't know the value of a low carb diet, because they have been told to eat a reduced fat diet their entire life. They are motivated but they need help. They need a new approach. This might be, for example, a middle-aged woman who comes in on her own, or a wife who brings her husband in because he has not been to a doctor in years. Sometimes the men have a health scare and are finally motivated to make a change. Once we discover together that they have a problem, they want guidance on how to deal with it. The way they get the most optimal guidance is through CGM, because it helps them spot their diet issues straight away. This information opens their eyes to what they're doing wrong and sets them on the right path.

But that brings up another issue. That issue is the usual excessive focus on an isolated, once yearly “fasting blood glucose”. This is the standard testing approach to evaluate the risk of prediabetes, diabetes, and insulin resistance.

The typical level marking a fasting blood sugar as being high is more than 100. This is the traditional cutoff defining prediabetes. Greater than 100 is prediabetes.

But even those with a fasting sugar in the nineties need to be careful. Many metabolic health experts believe (and I agree) that a fasting blood glucose in the mid to high nineties indicates insulin resistance that's already been brewing for a while. Ideally a fasting blood sugar should be in the low 90s or below. If it is higher, progression to prediabetes is a significant possibility.

CGM provides a wealth of information because it essentially assesses fasting blood glucose on multiple consecutive days. In fact it provides a fasting blood glucose every day. This allows the identification and addressing of insulin resistance early. And early intervention is key. I believe physicians should be attempting to identify people with insulin resistance early on, rather than suggesting to patients that they are safe if they come in under the cutoff of 100. Kicking the can down the road for another year based on a once yearly fasting blood glucose just under the cutoff loses valuable time. Worse yet, some docs will view a fasting blood glucose of just a little over a 100 as only worthy of a comment like “watch your diet and we’ll check it again at your next visit”. Problem is that my next visit may be a year away. Insulin resistance will be further progressing during that year.

### **Concern 2: CGM raises cardiovascular risk.**

Some social media doctors have also claimed that CGM may indirectly cause cardiovascular issues because measuring blood sugar leads to patients eating fewer carbohydrates and more fat. It is true that CGMs are used most commonly to guide a low carb, higher fat diet. (We will be talking a lot about this in future chapters.) The body digests carbohydrates and turns them into blood sugar, so the thinking goes that fewer carbs ingested means more fat ingested, raising the risk of cardiovascular disease. These clinicians are essentially making an argument against low carb, high fat diets altogether.

But my personal clinical experience, and a recent study indicates cholesterol levels don't go up significantly in patients with a high body mass index when put on a low carb diet. These higher BMI patients are the typical metabolic syndrome patients who make up my practice. Low carb diets are actually known to lower triglyceride levels in most patients. This is because triglycerides are produced by the conversion of blood glucose to fat in the liver. Cut off the fuel supply (high blood glucose), and triglyceride production is inhibited. So, for the vast majority of overweight patients,



insulin resistance and elevated blood glucose is a much bigger issue than the risks associated with a mildly elevated cholesterol.

It is true that there is a subset of low body mass index patients who may have an increase in cholesterol on a low carb, high fat diet. But these are not people generally seeking to lose weight. My typical patients are overweight, so it is very rare to see their prescribed low carb diets raise their cholesterol. In short, low carb diets do not raise cholesterol significantly for the majority of people seeking weight loss and improved metabolic health.

The idea that carbs are healthier than fats came from the Food Pyramid promulgated by the US Department of Agriculture in the seventies. In an effort to be healthy, as directed, people ate more carbs. As mentioned before, the result was the epidemics of obesity and diabetes we have today. I believe we all were misled by both the government and the food processing industry. Lower fat diets are not healthier diets for most people. (Though, some fats are healthier than others, as we will discuss in a later chapter.) And with those epidemics, increases in the prevalence of cardiovascular disease followed.

The notion that eating lots of carbs to avoid fat is a healthy dietary approach has been debunked by doctors Ken Berry, Jason Fung, and Phillip Ovardia in their respective books *Lies My Doctor Told Me*, *The Obesity Code*, and *Stay Off My Operating Table*. These books essentially disprove the idea that a high carb, low fat diet is the healthiest diet for most people. Unfortunately, it is the belief that they need to avoid fat that causes many patients to ignore elevated blood sugar for years. Most overweight patients are much better off paying attention to their blood sugar and level of insulin resistance, and paying less attention to a mildly elevated cholesterol level.

Remember that obesity, diabetes, and other vascular chronic diseases are among the top causes of death in the US. And for most people they're all related to high blood sugar, which results most often from the consumption of too many carbs.

Excessive carbohydrate intake is the common denominator. CGM and the counseling that comes with it discourages excessive carb intake, mitigating this harm. If eating too many carbohydrates causes these problems, the obvious solution is to eat fewer of them. So, the belief that

CGMs cause a person to eat an unhealthy diet causing cardiovascular disease makes little sense.

### **Concern 3: CGM may result in compulsive, disordered eating habits.**

CGM technology provides unprecedented insight into what's happening inside your body. While such information is useful and powerful, a logical concern is that it could cause obsessive eating behavior, and maybe even, in some people, an eating disorder.

Anorexia and bulimia both center around how much a person eats. And knowing their blood glucose level could conceivably lead a person into misguided attempts to over aggressively lower blood glucose to achieve weight loss. Adequate nutrition and caloric intake could be put at risk. The concern is that a person may try to target an unrealistic low blood glucose number and starve themselves until they meet that target. Or that they may seek a persistently low blood glucose pattern that is harmful and lose too much weight. This is an understandable fear, given that eating disorders are not uncommon.

The Emily Program, an organization devoted to fighting eating disorders, notes that vigilant diabetic individuals pay close attention to what they eat so they can manage their condition. At the same time, it may be logical to consider that this close attention may put patients at risk of developing an eating disorder. This is because these patients could conceivably become focused on managing their blood glucose by potentially harmful means such as starvation or bulimia. The Emily Program concedes that glucose monitoring is necessary for diabetics, especially Type I diabetics, despite these risks. There has been no suggestion by this organization, or any other organization fighting eating disorders or other experts in the field, that monitoring glucose in nondiabetics causes or exacerbates eating disorders. The Emily Program concludes that managing blood glucose to achieve health isn't consistent with increasing the risk of an eating disorder.<sup>4</sup>

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<sup>4</sup> Hilmar Wagner, "When Two Worlds Collide: The Dangerous Intersection of Diabetes and Eating Disorders," The Emily Program, November 1, 2019, <https://www.emilyprogram.com/blog/when-two-worlds-collide-the-dangerous-intersection-of-diabetes-and-eating-disorders/>.

Fitness website self.com asserts in a 2022 article that CGM is just a fad pursued by tech-heads as a dubious weight loss hack. The author of this article had her concern raised as a result of a series of ads marketing CGM for health optimization. The article allows that some prediabetics can benefit from monitoring their blood glucose, but it claims that the nondiabetic population, in general, has no need of CGM.

The article also asserts that obsessive tracking of blood sugar will lead to poor eating habits and various eating disorders. In place of glucose monitoring, the article advises nondiabetics to improve their diet and exercise regimens (without blood glucose data) to get their weight under control.<sup>5</sup>

The point that the article misses is that people who want to lose weight are going to diet, whether or not they are using a CGM. Diets, with or without a CGM can be taken too far. If people want to excessively restrict what they eat, they don't need a CGM to achieve that. With the use of a CGM I advise my patients that a calories-in, calories-out approach is not to be followed. I don't tell them to eat less (fewer calories). I *do* tell them to eat fewer carbs. I collaborate with them to target a carb intake that is manageable and will help them achieve their goals. The fact is my patients who use a CGM to complement a low carb diet can always eat something. The use of a CGM promotes a healthy approach to food, not a desperate attempt to starve yourself into thinness.

Childhood obesity and teenage eating disorders are a hot topic, and I can say with confidence that in my experience young people using a CGM suffer no mental harm from it. I treat obese teenage patients with parental involvement in collaboration with the patient's pediatrician. These patients have shown no increase in eating disorders, no dangerous change in behavior, and no additional stress. I have young patients follow the same low carb regimen as older patients. They do not fall into pathological eating habits like bulimia or anorexia. A comprehensive CGM program not only helps these patients reverse their obesity and poor eating habits, it leads them to improved health. In many cases, the CGM program for these young people has redirected the course of their health for a lifetime. It has helped them

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5 Carolyn L. Todd, "Wellness Influencers and Tech Bros Are Treating This Diabetes Device Like a Fun Trend," SELF, September 9, 2022, <https://www.self.com/story/continuous-glucose-monitor-wellness-trend>.

achieve weight loss and improved health success, when other previously attempted diets (like a calorie counting approach) were not successful.

Not a single patient of mine has developed an eating disorder while using a CGM. Remember “first, do not harm” is a dictum I live by professionally. No patient of mine has been starved into an unhealthy body weight. This is because I promote the use of a CGM as part of a comprehensive lifestyle change. The outcome sought, and achieved in the majority of my patients, is a healthy weight as part of a sustainable change to healthy habits.

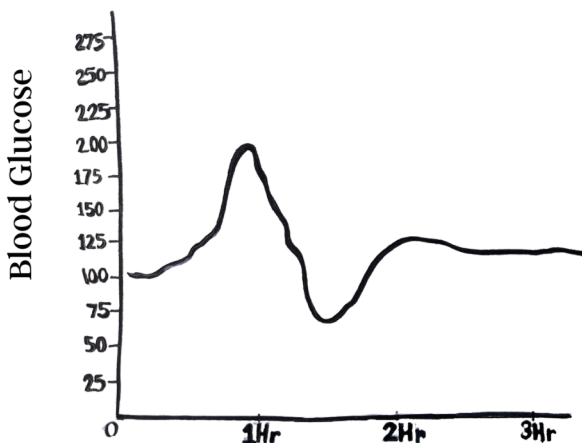
My patients trust me, and their positive outcomes make them trust me even more. You can't argue with results.

#### **Concern 4: Nondiabetics have no need to know about glycemic variability.**

I believe this statement is absurd for several reasons. First, a person with a fasting blood glucose in the “high normal” range (say 95 to 99) may have very significant swings in blood glucose. These swings would be undetectable without a CGM. Their nonfasting blood glucose may spike into the prediabetic range (greater than 160) after a meal and then immediately drop into a hypoglycemic range (less than 70). Paying attention to your blood glucose variability isn't just for diabetics. It's an important way to detect insulin resistance early and prevent prediabetes, and ultimately diabetes, from developing. The display of wide variations in blood glucose may also provide insight into the reason for after meal fatigue, or recurrent hunger, or even “brain fog”. Hunger results when the blood glucose drops low rapidly, and you are then looking for the next meal to bring that low blood glucose back up again. It's a roller coaster.

Here's a small but relevant way changes in blood glucose and insulin impact weight gain, health and even energy levels. Let's say you eat a doughnut. It causes a blood glucose spike. The spike is a signal to the pancreas to release insulin. Shortly after that spike occurs, insulin may bring the blood sugar down fast and hard. The amount of insulin released often “overshoots the mark”. The result is you feel terrible — the infamous sugar crash. A CGM allows the detection of these episodes. It also allows for dietary guidance to avoid major spikes in blood sugar in the future, so you can avoid that crash. You then remain at a much more stable and consistent blood glucose level. Fewer highs and fewer lows. By doing this you avoid the

side effects of glucose variability—the fatigue, the “brain fog,” and even the recurrent hunger causing you to repeat the cycle again.



*Blood glucose elevation curve after carbohydrate meal ingestion. The blood glucose “spike” causes insulin release resulting in a subsequent rapid drop of blood glucose into the hypoglycemic range. “Glycemic variability” is a feature of this common CGM pattern.*

Because glycemic variability can have such a big effect on health, level of fatigue, mood, and even hunger, knowing how it varies throughout the day can be crucial for many people.

It is true that some people don't need to check their glucose all the time. Those who have good metabolic health have a much lower risk of glycemic swings, diabetes and cardiovascular disease. They may not need a CGM on an ongoing basis. However, only about 15 percent of American adults are completely metabolically healthy. It is true that I occasionally place a trial CGM on a patient for a two week trial who ends up having no blood glucose elevations or significant swings in their blood glucose. That occasional patient with this CGM pattern usually also has no insulin resistance when we check their insulin level. If the patient chooses, we stop there. However, even these patients often see value in understanding subtle changes in their blood glucose associated with various foods. Most, if they are looking to achieve weight loss, see the CGM as a great behavioral tool related to diet. Most want to continue its use for this reason. A small minority may choose not to. For the vast majority of my patients the CGM

experience provides valuable information we can then act on to improve their health and help them lose weight.

In 2018, the UNC Gillings School of Global Public Health found that only one in eight Americans is achieving optimal health, with potentially dire implications for bad outcomes associated with chronic diseases like hypertension, high cholesterol, and prediabetes.

The fact is, only about 15 percent of adults are completely metabolically healthy. And comorbidities like hypertension and insulin resistance are all too common. The patients that come to me, again, are “self-selected” for a likelihood of poor metabolic health. They know they likely have some health issues. Most of the time they are right, and a CGM is the tool that both helps identify, and helps to fix their issues. It is true that the CGMs cannot be used in a vacuum, but when complemented with a comprehensive program and a knowledgeable metabolic health clinician, most patients will reach their weight loss and health goals.

Because 85 percent of US adults have serious metabolic issues, CGM is not some irrelevant sideshow for obsessives. Overweight or unhealthy US adults need a way to track their blood sugar so they can identify and then fix what's wrong in a more precise way.

Remember, I'm not saying CGMs should be used for long periods of time for people who do not need them. What I am saying is that the overwhelming majority of people can benefit from these devices because they have metabolic issues that at some point may lead to health crises like I see in the ER routinely. We can't afford to ignore the use of CGMs in nondiabetics if we want to begin to identify and remedy the metabolic disease present in most American adults.

### **Concern 5: Maybe CGM isn't right for me.**

We've made it clear that CGM has no harmful side effects, either physical or psychological. During the two-week trial period I do with patients they can ask as many questions about their data as they want. And remember, this data includes not only their CGM data, but also initial lab work including an assessment of their level of insulin resistance. We address not only data, but any associated concerns related to CGM use like comfort, cost, and ease of use. And we can revisit those questions on an ongoing basis, including the cost/benefit ratio of a long term CGM guided program related to their

health. Nearly all see the value. About 90 percent of my patients who do a two week trial elect to continue with an ongoing program. Continued use of a CGM is, of course, integral to their program plan.

The number of people who get no useful info from CGM pales in comparison to those whose lives this technology has changed. While you don't know how useful CGM will be until you try it, chances are you will benefit, at no risk.

For those with abnormal blood glucose as shown by a CGM, getting blood sugar under control, not only expands their lifespan, but also their health span. That is, it lengthens the time they can remain healthy enough to stay active as they age. They will also be much more likely to live free of disease for additional years. Why? Because a majority of chronic illness comes from vascular disease. And a majority of vascular disease results from high blood glucose, or significant glucose variability. For example, one 52-year-old diabetic patient of mine had lived with diabetes for six years. His sugars were often over 200, despite treatment with medications. He had never used a CGM. With a CGM guided low carb diet he dropped his hemoglobin A1C from 9.6% to 5.8%. (Normal is below 5.7%, so his hemoglobin A1C is now just above the normal range.) He was able to come completely off his diabetic medications . . . with better blood glucose control. And he lost forty-five pounds. Not only did he increase his likely longevity, but he feels physically much better. More energy, less fatigue, less brain fog. He is more mobile, and now pursuing activities like backpacking and running a half marathon. He would have never considered attempting those types of activities when he was heavier.

An important point is that I would not go as far as to say this patient is “cured” of his diabetes. Though a few metabolic health experts say diabetes can be cured, I prefer not to make such drastic claims. I believe the underlying condition of diabetes is still there. In such cases your body still isn't responding to your intrinsic insulin as if you never had the disease. But I do believe this patient, and others, can have their diabetes put into “remission.” With such great blood glucose control, the result of a CGM-guided low carb diet, the negative effects of diabetes are minimized. This includes the negative vascular effects and the potential for such problems as kidney failure, heart disease, and stroke.

The fact that CGM works for diabetics such as in this case very much reinforces my belief of the device's effectiveness at preventing and even reversing prediabetes as well. My patient was not a patient on insulin who would have been prescribed a CGM routinely to manage his insulin regimen. He was being managed with only oral glucose lowering medications when he came to me. So technically, before I saw him, he was "not appropriate" for a CGM prescription. Yet a CGM, in fact, changed his life. Analogously, I have now cared for countless prediabetics in which CGM has resulted in similar, even if not quite as dramatic, redirection of the course of their health. Many patients completely reverse their prediabetes using a CGM guided low carb diet. I very much believe in the value of CGM use for this purpose.

A CGM is an accessible therapeutic device that can help patients change their diet, control blood glucose and get their weight down. Whether you are diabetic, prediabetic, or nondiabetic I believe a CGM should be considered a "behavioral tool" that will likely improve health.

With the primary concerns about CGM out of the way, let's learn how this amazing new technology can work to help improve your health.



## CHAPTER 3



# HOW TO USE A CGM DEVICE

“I need to lose twenty pounds.”

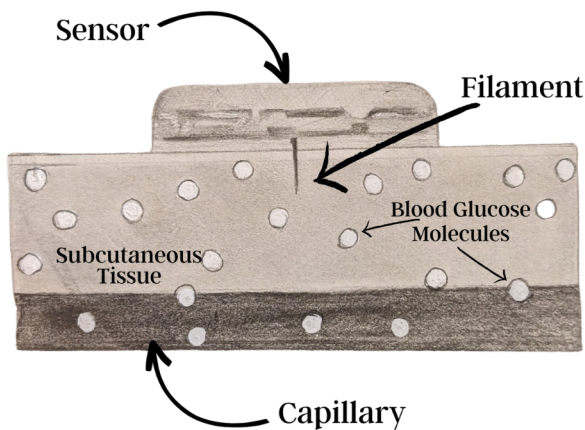
Such a very objective and simple desire. Yet, in practice, such a goal can be very hard to realize. You try all kinds of diets and exercise programs to lose that weight, only to see little or no progress when you look in the mirror or down at the scale. And you realize those extra pounds can also represent an underlying metabolic problem that could lead to, or has already caused, prediabetes, hypertension, or high cholesterol. Or the extra weight you are carrying may put you at risk for the bothersome symptoms of conditions like gastroesophageal reflux, sleep apnea, and abdominal discomfort from fatty liver disease or PCOS. In the back of your mind, you also know that excessive weight may even be largely to blame for the increasing discomfort in your knees and back.

Your lack of progress is a hard pill to swallow, though you wish you could take a pill to make it all go away.

Enter the CGM—the potential key for both weight loss and beating metabolic disease. Once it is on your arm, you can see your blood sugar rise and fall in real time. It keeps you motivated, and it’s so easy; you sometimes

wonder how you ever got along without it. Now you have a way to guide your diet, lose those excess pounds, and keep them off.

To use a CGM, you just apply the sensor to your arm. A filament placed under the skin comes in contact with fluid outside your capillaries (the interstitial fluid). Capillaries carry blood, and the serum component of that blood has glucose in it. That is your blood glucose. The filament assesses the glucose of the interstitial fluid, which reflects the level of glucose in the capillary blood serum. This number is sent to an app on your phone, which essentially shows you your blood sugar in near real time. The days of having no idea what your blood glucose is and how your diet affects it are over; blood-glucose management to achieve metabolic health has entered the twenty-first century.



*The filament sensor of the CGM rests under the skin and is bathed by the interstitial fluid in the subcutaneous tissue. The blood glucose level in nearby capillaries equilibrates with the blood glucose level of the interstitial fluid, and this level is registered by the sensor.*

Your CGM lets you impose discipline on the too-often chaotic process of diet. With a device giving you continual real-time updates, you can see how your dietary choices affect your blood sugar. And that makes ditching all but a small amount of carbs exponentially easier.

Now, just sticking a CGM on your arm won't melt the pounds off like popping a fictional diet pill. Making the most of this device does take some user effort. Here's how to use it.

## THE BASICS OF CGMS

Applying a CGM is simple and painless. And you'll find it intuitive to use. Most patients with a CGM forget they're wearing it when they're not checking their numbers. If you can use phone apps, you can master your CGM.

Your CGM comes packaged with an applicator and the disk-shaped sensor, both sealed in sterile containers. You place the sensor on the applicator and use the applicator to attach the sensor to your skin. It sounds like a small stapler when being applied, but there's almost no sensation. That's it. Then you go about your day as normal.

It used to be, with an earlier model of the CGM called the Abbott Freestyle Libre II, that if you didn't scan (wave your phone over the sensor) every eight hours, you would lose some of your data. However, the new CGM model, Freestyle Libre III, sends data from the sensor to your app via Bluetooth technology 24-7 without interruption.

### The Truth about Off-Label Use

Since CGMs have historically been reserved for diabetics, nondiabetics have to be prescribed the device off label. We talked in Chapter 1 how it is very common for physicians to prescribe medications and devices off label. Examples of such off-label use include:

- Seroquel or Trazodone for insomnia.
- Gabapentin (Neurontin) to manage pain.
- “Stents” meant for blood vessel use being used in other body locations like the lungs or gastrointestinal tract.

In recent years, nondiabetics have embraced CGMs to help them lose weight and improve their metabolic health. Interest in CGM for health and nutritional purposes is growing, even among those who are already at optimal weight. We've previously mentioned a group of young, healthy techies using these devices to “super optimize” their metabolic health and workouts. (In the next chapter we will even briefly discuss a patient of this type.)

But improving metabolic health for most of us means more than restoring blood glucose to reasonable levels. It also means avoiding problems

commonly associated with excess weight, like elevated blood pressure and high cholesterol. In addition, most metabolic health specialists prescribing and guiding our patients in the use of CGMs also focus on reducing fatigue, optimizing sleep patterns, and enhancing mental clarity.

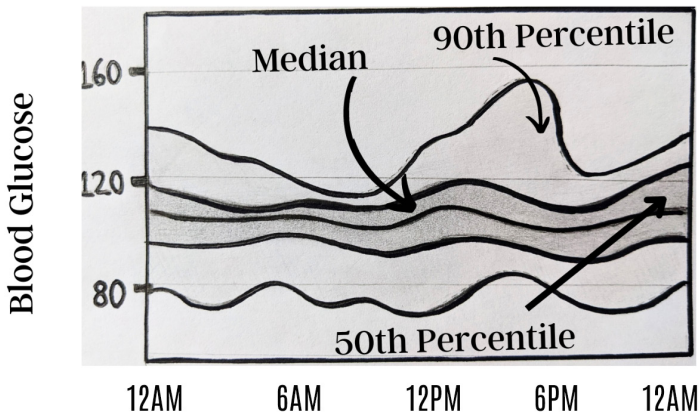
Since all these issues can be linked to blood sugar, more and more people are beginning to utilize CGMs to measure their progress: that is, progress not only related to the weight on the scale or the image in the mirror, but also in reversing disease and/or relieving symptoms associated with disease. Some people, including that small subset of overweight but metabolically healthy patients we discussed earlier, are using CGMs not only to lose weight, but also to prevent metabolic conditions from ever occurring in the first place. For most people, the benefits of easy-to-read blood-sugar levels 24-7 can't be overstated.

Your CGM not only provides minute-to-minute data but also averages all the data it collects over a twenty-four-hour period. The CGM app can then also put a week's worth of that data in a single graph. So, for example, you can see what your overall average glucose is on a given day and compare one day to another or, to follow your progress, one week to another.

And the app is also set up to show your data averages at specific times, like 6:00 a.m. or noon. That way, you can see when you tend to overeat, eat excess carbs, or have lapses in your fasting pattern. You can then adjust your habits accordingly. Because you can share your data in real time with your physician, he or she can follow that data as well.

The average reading at various times of day is called the average glucose pattern (AGP). This pattern demonstrates your median glucose at any given hour of the day, from data that has been collected over weeks or even months.

Here's an example of the value of an AGP reading. You can know your median number at, say, 6:00 a.m. This is basically equivalent to an average of multiple fasting blood glucose lab tests. And you get this number on an ongoing basis, not just once or twice a year when you have labs drawn. Or maybe you want to follow your median number at 10:00 p.m. because you have had a problem in the past with evening eating. You can even see what your fiftieth and ninetieth percentiles at these times look like. (Those percentile readings are an indication that you are in your desired range at a given time of day 50 percent or 90 percent of the time.)



*A twenty-four-hour average glucose pattern or AGP. The central line demonstrates the median glucose at a given time of day. The dark-shaded area indicates readings in the fiftieth percentile and the light-shaded area readings in the ninetieth percentile.*

Reviewing this data allows you to link your habits to your actual numbers and see where you're falling short or doing well. You can then take action to change your habits when needed. CGM is empowering and reinforcing in this regard. You can see how new eating habits help you meet your goals. The data is right there. This information alone can help you get your health in order by gamifying it. Making it enjoyable. That's powerful motivation because, in the back of your mind, you know if you lose *this* game, the result could be a life-impacting disease. Winning at this game is not just fun; you know it is making a big difference in your current and future health.

### **CGMs and Insurance Coverage**

Nondiabetics usually do not receive complete insurance coverage for CGMs. However, many if not most private insurers will cover some of the cost of the device for nondiabetics. Some insurances require a prior authorization for a CGM (confirmation of a diagnosis of diabetes), but most don't. This means that private insurers usually cover some of the cost of CGM for most of our patients. The 100 percent out-of-pocket cost is usually around \$70 for a two-week sensor. (This is the price for someone paying the full cost of the device themselves with no insurance help.) In our experience, for the insurers who do provide some coverage (including for nondiabetics), the

copay for a sensor usually costs the patient about \$30 out of pocket. Refills cost the same, so wearing a CGM entails a recurring expense of about \$60 per month for most of my patients (\$140 per month for the occasional patient who has no insurance coverage). Some of our patients' insurance provides coverage at a higher rate, reducing CGM cost to \$25 or less, or about \$50 per month.

Traditional Medicaid and Medicare usually do not provide any coverage. However, if a person belongs to a Medicaid managed care plan or has Medicare Advantage or supplemental coverage, some of the CGM cost may be covered.



*The appearance of a CGM graph on a smartphone demonstrating blood-glucose elevations, drops (hypoglycemia), as well as a period of blood-glucose stability in the desired range.*

Almost all our patients have sensor-compatible phones (an NFC-enabled iPhone 7 or later running iOS 11, or an Android phone with OS 5.0 or higher). So downloading the app and using the phone as the receiver for the sensor data is the norm. Very occasionally, one of our patients will have an older phone, and if this is the case, the patient must purchase a reader from Abbott to read the sensor's signal at a one-time cost of \$85. It is rare for patients to need to purchase a sensor, as most already have compatible phones.

In my opinion, the price of CGM pales in comparison to the cost of developing Type II diabetes and the other metabolic diseases that often accompany high blood glucose. Or even the cost of diseases associated with

excess weight. Think about the cumulative costs of the doctor visits and medications if you are living with one or more metabolic diseases as you get older. And these are not rare health problems—hypertension, for example, affects nearly half of all American adults. And then there are also the symptoms associated with excess weight and high blood glucose as well as the costs associated with treating these symptoms. Consider the symptoms associated with gastroesophageal reflux, sleep apnea, fatty liver disease, knee and back pain, and peripheral neuropathy. The medications alone for the treatment of these conditions can challenge most budgets. This is especially true in this era of high-deductible health plans in which the first \$3,000 of medical costs for the year are on you.

The worst-case scenario is an eventual clogged artery leading to a heart attack, stroke, or some other vascular crisis. And that cost, of course, is not measured only in dollars. The damage to quality of life is almost incalculable.

Remember, I believe keeping your weight and blood glucose down are the most important things you can do to stay out of the ER. So, though medical costs are not the primary reason people seek to avoid medical conditions, long-term medical costs should be a concern for nearly everyone. I don't dismiss the expense of CGMs for my patients, but I feel the long-term financial and health benefits of the device well outweigh the short-term monetary impact for nearly all of them.

## GETTING STARTED WITH A CGM

Since 95 percent of our patients use a specific device, in this discussion of initial use, we'll focus on the Freestyle Libre CGM by Abbott Pharmaceuticals. It's the most popular CGM in the US primarily because of its simplicity. It costs a slight bit more than its two competitors, the Dexcom and the Medtronic Guardian, but in terms of ease of use, I believe it is the clear winner. The units of all three brands have similar functionality. So our discussion of initial use largely applies to the other two brands of CGMs as well.

The sections that follow discuss sensor application and pairing the sensor with the Freestyle Libre smartphone app. The process to get up and running from the time you take the sensor out of the box to the time

you are reading data is very simple. In my office practice, my staff and I will walk our patients through this process for the first time. We do this with our telemedicine patients as well. However, some of our telemedicine patients have no problem applying the sensor for the first time at home on their own. Some of them, after reviewing an internet video or two, already have the device on their arm when I see them on my computer screen for their first telemedicine visit. (We've already sent them their device or called in a prescription to their local pharmacy.) All our patients, after the first application, are set to go on their own with routine prescription refills and repeat sensor applications every two weeks.

### **Initial Sensor Application and Use**

The CGM sensor for the Freestyle Libre III is about the same diameter and shape as a penny and as thick as two stacked pennies. The FS Libre II version is slightly larger but not much more noticeable.

The sensor is approved for placement on the back of the arm. Because the sensor is so small, it is not noticeable under clothes. If you wear a short-sleeve or sleeveless shirt, it will be visible. Most of our patients do not mind this as it generates occasional questions about the device, mostly from friends but occasionally even from strangers.

They view this as an opportunity to spread the word about their CGM experience and how the device's use is helping them make big changes to their health.

The sensor sits atop an adhesive patch, which is attached to the skin. The tiny filament probe, thinner than an acupuncture needle, is placed a few millimeters under the skin. The whole application process takes only a few minutes.

As discussed previously, a sensor lasts two weeks before needing replacement. I haven't found that placement discomfort affects any patient's decision to continue CGM use. Nor has any patient of mine complained of ongoing arm discomfort while wearing a CGM.

The skin at the site of application should always be sterilized with an alcohol wipe before placement. We have never seen a skin-site infection as a result of CGM use. This is true despite the fact that many of our patients prove to have higher blood glucose than normal (as most are metabolic



syndrome patients), and high blood glucose places patients at increased risk for infection.



*CGM sensor being applied by a user to the back of their arm. Application is essentially painless and takes less than five minutes (total time of preparation for applicaiton and actual application).*

Early on in my practice, a small percentage of my patients' sensors came off before the end of the two-week period. This was almost always the result of having the device dislodge when drying off after a shower or when taking a shirt off. I now ask all my patients to be aware of the device during these activities. However, preventing the device from coming off can be easily accomplished with two techniques, both of which we recommend to our patients.

The first helpful option is to use an adhesive barrier wipe to make the skin sticky before placement. These also have alcohol in them, so they help with additional sterilization. Abbott provides a sensor adhesion guide on its website. This guide includes recommendations of several different types of skin sticky tack products. However, there are plenty of other skin tack brands on the market that work just fine. The brand many of our patients use is called Skin Tac Barrier Adhesive Wipes.

The other technique is to cover the sensor with an adhesive patch. This method almost guarantees that the sensor will stay in place for the entire two-week period. These patches are designed specifically for the Freestyle Libre, so they are sized to fit over the sensor in a precise manner.



*CGMs are best kept in place not only by the adhesive on the sensor itself but also the use of skin tac and an adhesive bandage.*

A variety of adhesive patch products are available to cover the unit and keep it in place. Many of our patients use a brand called Skin Grip. I have used this product myself, and it works very well. Patches make the device a little more obvious (if wearing short sleeves), but I feel that the increased protection is worth the slight increase in noticeability.

We suggest using both methods to assure the device stays in place: a skin tack wipe for pretreatment of the area of placement and the patch. With this approach, it is very rare to have an issue with a sensor coming off. We advise our patients that they can shower or be in the tub, hot tub, or even a lake or the ocean for short periods of time (ten to fifteen minutes). Rarely is this an issue causing problems with sensor adherence. As an aside, there are also Velcro wraps available for extra protection (search Amazon) if desired.

Once the sensor is placed, you activate it with the app. With the Freestyle III, the sensor can be activated automatically from the phone app. And readings will be obtained automatically via Bluetooth. With the Freestyle II version, you just wave your phone over the sensor to scan for a reading.

With the Freestyle II, your phone obtains the reading from the sensor through near-field communication (NFC), the same technique used to pay

for items by tapping your phone or credit card to a merchandiser's terminal. This reading must be obtained at least every eight hours by waving the phone over the sensor. With the II, when you take a reading, all data from the last eight hours or since the prior reading—whichever period is shorter—is downloaded to the app. If a reading is not done for eight hours, any data gathered prior to that time is lost. For example, if a reading is done at 10:00 p.m., and the next reading isn't performed until 8:00 a.m., the data between 10:00 p.m. and midnight is not retained.

Every time the phone is waved over the sensor, a blood-glucose reading at that moment is provided. A patient may wave the phone to get a reading as often as they want in order to see their blood glucose at that moment. But again, a reading must be taken at least every eight hours, or data will be lost. There is a reminder notification system built into the app, and many of our patients use this option, so that they remember to “wave” in a timely manner.

After initial placement, some patients may be satisfied with scanning only ten or twelve times in the first day of use. I have others who are so fascinated with the device that they may scan fifty times in the first twenty-four hours. With long-term use, most of my patients fall into a routine of scanning about ten to twelve times per day.

At this time, nearly all pharmacies have the II available. However, the III has just come on the market in recent months. Many pharmacies are not yet carrying it. It is uncertain how wide the availability of the newer version will be in the near future.

The Freestyle III utilizes Bluetooth technology. This is a great development because now, no waving of the phone over the sensor is necessary. No data is lost as, with the Bluetooth technology, readings are continuous 24-7 without waving. With either the Freestyle II or III, once the sensor is activated, it will take an hour to provide the first reading. After that, 24-7 blood-glucose readings will be available for the two-week life of the sensor.

### **Setting up the Smartphone App (Yes, There's an App for This)**

Once the sensor is activated, you must perform a basic setup on the app. This is very simple and involves setting such adjustments as indicating that you want your blood glucose units measured in milligrams per deciliter (mg/dL) and the carbohydrate amounts recorded to be entered in grams

(gr). The latter setting allows you, if you choose, to record the number of carbohydrate grams ingested with each meal or snack. Monitoring your carb intake and seeing the impact on your blood glucose will become intrinsic processes for you as part of your low carb health improvement and weight-loss strategy. (See below.) Some of our patients use this function on the Freestyle Libre app, but others choose to use an app that provides more detailed macronutrient data like Carb Manager, Cronometer, or My Fitness Pal.

As part of the setup, you'll also be able to create an account with a username and password. Doing so lets you access your data on the Freestyle Libre website by laptop or other device (in addition to your phone). The website allows you to review your data (for example, blood-glucose patterns) in a more detailed manner than the phone app allows.

You can also indicate that you want to share your data with your medical provider using the LibreView feature and a provider-specific code. Though they have the option not to share data, all my patients do so as they want the benefit of both me and my staff of nutrition coaches and trainers reviewing their ongoing data. We then provide detailed feedback based on this data, including guidance to patients related to their dietary choices.

As you do your setup, you will also have the option to turn on or off various types of alarms. Because these devices were originally meant to be used by diabetic patients injecting insulin, the alarms are almost universally not helpful for my patients. The alarm settings allow notification if a blood-glucose reading is too high or too low. All can be turned off, except the alarm for a very low blood glucose. I have not yet had a patient who had a blood-glucose alarm go off related to a low blood glucose episode (hypoglycemia) that was clinically meaningful. So I suggest to my patients that they turn off these alarms to the extent possible.

Back to the subject of food data tracking. These days, most of my patients are opting to enter their macronutrient data in apps specifically made for this purpose. Examples include My Fitness Pal, Carb Manager, and Cronometer. These apps help patients track not only their carbs but also their full macronutrient mix (as well as calories if they choose).

Whether it's done with the Freestyle Libre app or another app, tracking these metrics is essential, especially early in the weight-loss journey. It

helps patients understand which foods affect their blood sugar the most and this tracking also facilitates dietary modifications. This approach also underscores the importance of accurate carb counting. Patients who enter detailed data in these apps tend to have greater accuracy related to daily carb grams ingested. If you don't track this data, you have a tendency to underestimate this number. These apps have a scanning capability, so food labels can be scanned to help with this tabulation. I do request, in general, that my patients use these scanning functions and/or weigh or measure their food. I have done this myself, and it is not an onerous process. And knowing the exact number of grams of carbs you take in each day makes a big difference.

Paying close attention to the food you eat is essential to improving your health, so recording the nutrients you take in drives home the importance of sticking with this program. It also allows my patients to associate their weight loss and health improvement closely with their diet.

### **What about CGM Accuracy?**

CGMs are accurate in most cases, but occasionally, a sensor may malfunction. If you feel a series of readings are not accurate, you should review your concerns with your prescribing medical provider. If your doctor is in agreement with your concerns, they will likely direct you to contact the manufacturer for a replacement.

Abbott Pharmaceuticals' helpful service representatives have been very good about addressing my patients' concerns about the relatively rare inaccurate readings that do occur. When inaccurate readings happen, they are usually inaccurately low. (See below.) If the sensor is malfunctioning and this cannot be resolved, Abbott will frequently replace the sensor at no cost. Most replacements arrive by express mail within forty-eight hours. The company's representatives will not discuss a problem sensor with me as the provider as they will only speak to the patient directly. (They want to speak directly with the patient because of confidentiality concerns; Abbott does not routinely accept confidentiality releases from patients.)

Because most of my patients are nondiabetic, I don't often see very, very high initial readings (above 300). The exception to this is a diabetic patient who comes to me for help with management of blood-glucose levels they already know are a real problem and who want to fix this with diet as opposed

to more medicine. However, not infrequently, I do see high readings in the 175 to 250 range in patients who were not previously aware they had a blood-glucose problem. We actually see many patients who were not aware they were prediabetic who had fasting blood-glucose levels consistently greater than 100 and spikes recurrently above 175. These numbers put them in the prediabetic range. This is consistent with the known statistic that half of prediabetics don't know they are prediabetic. Some of these patients think their readings are inaccurate, but unfortunately, they are not. I seldom see an inaccurately high reading.

And I occasionally also see patients who were not aware they had a blood sugar problem who are fully diabetic. They come to me for weight-loss help but are found to have glucose spiking above 220 and fasting levels in the 130s (indicating the presence of diabetes). Obviously, for these patients, the issues are much greater than just weight loss.

Both these prediabetic and newly diagnosed diabetic patients may have been told by their doctors previously that their fasting blood glucose was "a little high." But they really had no understanding of how significant this issue was. And with a once-a-year fasting blood glucose, maybe it really was just up a little bit on the particular day they had their blood drawn. Again, only with a CGM can you get the full picture.

I do see some falsely low readings occasionally. This occurs in two scenarios. The first is right after a sensor is placed. The sensors often seem to take twenty-four to thirty-six hours to acclimate to the environment of the interstitial fluid just beneath the skin.

Sometimes during this period of time, patients will get inaccurate reading in the 70s, 60s or even 50s range. As mentioned earlier, I've never had a patient with a clinically significant symptomatic hypoglycemic event during this time. After a day or so, the sensor seems to adjust to its new environment, and accurate readings are obtained.

The second scenario is that of a bad sensor. This occurs, in my estimation, about one out of every fifteen sensor placements. The filament never seems to acclimate, and the low readings persist for more than a few days. I don't think the sensor is truly "bad" from a technical or manufacturer standpoint, but I do believe the filament never settles into the environment of the tissue

under the skin. It is in this case, after reviewing the blood-glucose data with my patient, I suggest to them that they contact Abbott for a replacement.

Remember that CGM measures the glucose level of interstitial fluid, which is constantly influenced by the blood serum glucose level. Because the sensor doesn't take a glucose reading straight from the blood serum, there is about a ten minute delay between current blood-glucose readings and the monitor's measurement. Nevertheless, a 2020 study in the journal *Diabetes Technology and Therapeutics* found the Freestyle Libre was accurate for use by diabetics, who, of course, are deciding insulin dosing based on these readings. That said, a CGM can have up to a 12 percent margin of error in comparison to lab-tested blood glucose. Despite this limited inaccuracy, the readings are consistent, so the CGM reflects actual blood glucose within a small margin of error and trends blood glucose very accurately. Changes in blood glucose up or down are very reliable as reflected by the CGM.

So if you did a blood-glucose finger stick to check a CGM reading, it might not exactly reflect the CGM reading. However, the difference might not be entirely caused by the CGM. Finger-stick devices themselves have an error margin of 8 to 10 percent in comparison to lab-tested blood glucose. Basically, the accuracy of a CGM and a finger stick are similar, and both have been approved by the FDA to guide diabetics in selecting their insulin dosing. If diabetics can trust these devices for this purpose, you can certainly trust a CGM to guide your diet.

A few additional caveats. Large doses of vitamin C can throw off the sensor's accuracy, resulting in falsely high readings. I make all my patients aware of this as we begin their program, and I have never had a patient with an issue related to vitamin C. While wearing the sensor, it is recommended that you do not take more than 1,000 mg of vitamin C daily.

Increased doses of aspirin (salicylic acid) have been shown to cause falsely low CGM readings in several studies. However, this is only at doses of 500 mg to 1,000 mg per day. So the standard daily dose of 81 mg recommended for patients with cardiac issues does not affect CGM readings.

Significant dehydration can also produce inaccurate results. I urge my patients to drink plenty of water, which, of course, is a good idea in general. Many of my patients do intermittent fasting, so hydration is always emphasized anyway. Adequate hydration is especially important for

individuals pursuing a diet regimen focused on weight loss. This is especially true if increased protein intake is part of the plan, as it usually is with a low-carb diet. Adequate hydration helps protect kidney function.

I will review in detail in a later chapter how CGMs change eating behavior. However, for the trial period with patients, I universally ask them not to change their eating habits. Seeing the blood-sugar pattern of their standard diet can ultimately be very motivating. Many of them get a sense of how glucose spikes and variability are wreaking havoc with their insulin levels and metabolism. They gain insight into why they are having periods of fatigue or brain fog. They then understand how stable lower blood-glucose levels will help with weight loss and improved metabolic health. Ninety percent of my patients continue with the Metabolic MD program after the trial period for at least six months, many indefinitely. More than vague warnings or a bunch of numbers on a lab report, a CGM trial often initially provides patients with a sense of urgency to change their diet in order to improve their health. It then can provide a roadmap to weight loss and metabolic-health success.

### **Long Term Continuous vs. Periodic CGM Use**

Another question regarding CGM use is whether patients need to use the device constantly for an indefinite period or the device can be used just intermittently for periodic dietary fine tuning. Given the expense of a CGM and the need to see a provider for associated prescriptions and medical management, this is a good question. I have patients who never again want to be without a CGM and then others who feel they may only need it for a periodic evaluation of their status after an initial period. That initial period is usually six months to a year, but this is not universal. It can be shorter or even longer.

I believe the device is best used as part of a comprehensive, ongoing program. The CGM weight loss and metabolic-health program Metabolic MD offers will be described in detail in Chapter 5. This device's use is indispensable for the initial months of the program. However, this is not to say a CGM must be worn continuously and indefinitely after that period. Every patient's situation is different. Some patients warrant more use than others (i.e., need ongoing data more than others to stay on track). However, as a patient's weight loss and metabolic-health improvement progresses,



occasional breaks from the CGM are appropriate. And remember, CGM data isn't the only variable being monitored during a patient's journey to better health. Ongoing weight monitoring, periodic insulin-level assessment, and even body fat percentage can be helpful. But these other variables do not offer the 24-7 feedback a CGM does.

As described, constant CGM use during an initial phase of evaluation and intervention is very important. I have mentioned the two-week trial for our new patients. This initial "data dump" is helpful in assessing current blood-glucose and insulin-resistance status. During these initial few weeks, however, a patient has not yet made significant lifestyle changes. In my experience, the continuous use of a CGM for a minimum number of months after a trial period is important in reinforcing dietary and lifestyle changes.

I believe that a CGM, in general, should be in constant use at least nearly until your weight-loss and metabolic-health goals are met. (There is a single exception to this approach as noted below.) A reasonable time to make a lifestyle change using a CGM is about six months, with the CGM being used through most if not all of this period. If patients want to continue use after reaching initial goals or achieve even loftier fitness and weight results, we help them attain success with their desired plan. I have had numerous patients who, for example, set a weight-loss goal of, say, 35 pounds. Once they have met that goal, sometimes they just want to keep going. I recently had a male patient in his fifties who wanted to get from 265 pounds to 230 pounds. He met that goal using a CGM, a low-carb diet, intermittent fasting, and strength training.

Once he met that goal, he decided he wanted to keep going. His new goal is 210 pounds, and after a few months, he is halfway there. These patients who do a reset almost always continue to use their CGMs as they pursue their new goals.

So most patients want to use the device continuously. But other patients need a bit of a break after three or four months. I call this break a CGM "holiday" as it is a temporary respite from CGM use. Most breaks only last a few weeks. An example is a patient removing the device during a vacation or other special-event periods like weddings or graduations. This is fine, though I ask them to largely maintain their diet plan while on this hiatus. They do so, but without the guidance of the CGM, they may come back

a few pounds heavier. Often, by that time, they have missed the guidance their device provides and are ready to get back at it. They actually miss the structured lifestyle changes they have been so successful at implementing.

In general, patients who meet their goals after about six months and have achieved significant lifestyle changes sometimes do well without continuous subsequent CGM use. However, most choose to use the device intermittently going forward after this in order to “stay grounded” in their lifestyle and dietary changes. About two-thirds of my patients continue under my care with intermittent CGM use after six months. On the flip side, some have made permanent changes and no longer need a device or me. (I view this as a success.) Additionally, I have had a limited subset of patients who felt they were good to go on their own after completing my program but then returned, seeking CGM guidance after backsliding on their diet and gaining back some weight. All my patients, even if they decide to leave my care after six months or even a year, know they can always come “back home,” and our work together will pick up again based on their current status.

Patients who have attained success with the low-carb lifestyle using a CGM seldom return to eating large amounts of carbs. Their mindset and lifestyle changes are permanent. As one patient put it to me, “After seeing what doughnuts and pizza do to my blood glucose, I can never unsee that. I will never think about eating those foods again without seeing those CGM spikes in my mind.”

### **A Few Words on Remote Monitoring**

As discussed, the data on your CGM can be remotely reviewed by your health-care provider. This can be done in real time by your provider, but I generally do this on a periodic basis, usually weekly and just before appointments. I do not necessarily want to offer a “big brother is watching” service in which patients are worried they are going to hear from me based on a single blood-glucose spike. Remote monitoring of CGM patients’ blood-glucose data by health-care professionals is routine. I don’t think the knowledge that I am monitoring their data influences all my patients’ eating behavior, though for some, I know that it does. I know this because they ask me to keep an eye on their numbers. And I do so and intervene with a text or portal message if they are getting off track, usually demonstrated by

higher-than-expected numbers over a period of a few days. That does not happen often as if patients do get off track, and they have asked me to watch their numbers, they most often self-correct before they get a text or portal message from me or my nutrition coach.

Some CGM programs allow data to be shared with close family and friends as well. This is only done at the complete discretion of the patient. This feature was originally meant to help diabetics, especially bad diabetics on insulin, alert family members of very high blood glucose or hypoglycemia. A minority of my patients who are not diabetic or on insulin share their data with a friend, family member, or even a fellow patient. They view this as providing additional accountability for their dietary decisions. Those friends or family members who receive this information act on it only very occasionally. Just knowing that their data is being reviewed by both their doctor and another person can be helpful to some people. It's a seldom used safety-net.

Recall that in Chapter 2 we talked about some of the behavioral aspects of CGM use. Let's revisit that topic. Recent studies of the psychology of CGM use in diabetics have found no adverse psychiatric effects stemming from CGM utilization or data sharing. In one study, two hundred diabetic patients were randomly assigned to six months of the normal diabetic regimen (finger sticks) or CGM-directed care. This included patients using a CGM who were sharing that data with family members. Researchers measured anxiety levels related to the patients' diabetes management.

They found no negative psychological effects, such as increased anxiety, in the CGM group. Also, the patients using CGM stuck to their diets and their treatment regimens more closely than the non-CGM group and, in surveys, were measured to have improved quality of life.

Additional studies have suggested that CGMs decrease anxiety and stress for diabetics because diabetes patients feel they have more control over their disease. These studies have also shown these patients have a greater sense of security when they share their data, knowing their doctor or a family member can help if their numbers go too high or too low.

In summary, my experience is that remote monitoring and sharing of data with both health-care professionals and family can be a very valuable

aspect of CGM use. This approach is motivating to most patients and allows for intervention sooner rather than later, when rarely needed.

### **How to Obtain a CGM**

*These CGMs sound great, you're probably thinking. Now, how do I get one for myself?*

Simple answer—you need to have one prescribed by a licensed medical provider. However, when seeking one, I strongly believe it's best to pursue a relationship with a medical provider who knows how to guide you on the effective use of a CGM. That is, if you are going to go through the time, effort, and expense of using a CGM, do it as part of a comprehensive plan. This likely means working with a physician who specializes in weight loss and metabolic health.

Time and effort can be lost utilizing a provider not familiar with how to adeptly evaluate your issues (for example, the presence of insulin resistance) or who is not experienced at assisting you in using a CGM as part of a comprehensive program. Look for a provider who has helped at least hundreds of patients along this journey. Look at the provider's Google reviews. Asked to speak with a few of their current or former patients. Ask them to explain their program and success rate. You don't want a doctor who will just hand you a CGM and wish you luck. You do not want to waste time, effort, and money without the best guidance.

Unfortunately, most primary care providers do not have this expertise and experience. They have limited time in those short patient appointments, and most of that time is spent treating disease with medication by making dosing adjustments, or maybe even adding a new medication. Most primary care providers are great at disease management, but have a limited depth of knowledge on issues like the evaluation of insulin-resistance levels or providing guidance to patients regarding a low-carb diet using a CGM.

### **“Non-Invasive” Monitoring Is Coming**

Though it will likely be a number of years before they are on the market, noninvasive glucose monitors will be available at some point. There are a number of medical device companies who have these in the research development phase, with a few of the companies already in clinical trials. These monitors, for the most part, use the technology of high-frequency

radio waves to measure blood glucose under the skin without the need for a filament. Some companies, alternatively, are working on the use of spectroscopy (think tiny non-thermal lasers) for this purpose. The sensors are considered non-invasive because there is no transgression of the skin to measure interstitial fluid glucose directly. No filament, no break in the skin is needed. The prototypical sensor would be like the wristwatch you use to measure your pulse, but it would give you 24-7 blood-glucose readings.

These devices will be initially marketed for use by diabetics to assist with insulin management (like CGMs today). Their accuracy will therefore need to be as good as current CGMs to ensure patient safety (accurate detection of both high and low blood glucose). My impression is that the technology will require a number more years in development. The sensors, of course, would require FDA approval as medical devices. FDA approval will likely be only for insulin-dependent diabetic use initially. I am not aware of any current studies in process specifically studying blood glucose and associated insulin dosing.

When they are introduced in the market, these monitors will likely be very expensive. But as is the case with most new technology, prices will come down over time. Stay tuned on the research development, FDA-approval process, and eventual availability of these noninvasive monitors.

### **Calculating Insulin Resistance**

As you begin CGM use, I believe it is critical you find a provider who is versed in the concept of insulin resistance and knows how to determine your specific level of resistance. Insulin-resistance-level calculation is an integral part of a metabolic-health evaluation. This is done by measuring a simultaneous fasting insulin level and fasting blood glucose. Because higher insulin levels should lower blood glucose (by forcing blood glucose into organs), if an insulin level is a little high, then blood glucose should be in a lower range. If the blood glucose is not low, then this means the insulin being released by the pancreas is being resisted by the organs (muscles, for example). If this is the case, a blood-glucose amount commensurate with the amount of insulin being released is not being soaked up by those organs to be used as energy. Conversely, if a low or moderate insulin level is lowering the blood-glucose level appropriately, it is unlikely significant insulin resistance is present. A normal insulin range is 4 to 24 Mcu/ml. I

like to see it under 10, but again, the interpretation of this number depends on the simultaneous fasting glucose. I have seen patients with fasting insulin levels as low as 3 or as high as 65. Be aware that a fasting insulin level is of limited (or no) value in a patient taking insulin because the exogenous insulin (insulin injected to manage diabetes) will affect the results.

The calculation done to determine an exact level of insulin resistance is called the “Homeostatic Model of Insulin Resistance” or, more simply, the HOMA-IR. It is just a calculation, with an adjustment factor to obtain a standard number, to achieve an accurate display of an individual’s level of insulin resistance.

A HOMA-IR under 2 means no insulin resistance. A number between 2 and 3 means early insulin resistance, and numbers 3 and higher indicate the presence of insulin resistance.

The higher the number, the more insulin resistance is present. I have had patients with numbers as low as 0.8 and others with numbers as high as 40 (usually diabetics not yet on insulin).

## **Finding An Experienced Metabolic Health Provider**

Back to the topic of finding a provider experienced in metabolic-health evaluations and metabolic-health improvement treatment approaches. Search for metabolic-health physicians in your area or licensed to provide telemedicine services in your state. We metabolic-health specialists know how to analyze patient data sets unique to our speciality practice, like fasting insulin levels and insulin resistance calculations. We know how to adeptly evaluate CGM patterns, even subtle but meaningful glucose pattern variations. We take the time and effort to educate patients on low-carb diets, intermittent fasting, and the optimal exercise regimen to decrease insulin resistance. Many of us are also very experienced in the use of the new FDA-approved weight loss medication Wegovy (also called Ozempic with the generic name semaglutide) and integrate this medication into our comprehensive programs for a subset of our patients. (More on this in Chapter 9.)

You can start your search for a metabolic health physician by spending a little time on the internet searching “metabolic-health physician”. A search

for “low-carb physician” may also be productive. With telemedicine, many providers can see patients in multiple states. At this time, I treat patients by telemedicine in Ohio, Indiana, Florida, and Arizona and anticipate being licensed in a number of additional states shortly. I’m gratified that some of my patients actually live in states adjacent to where I am licensed and drive to one of my licensed states so I can provide their care. For example, I see a number of patients from the Chicago area who drive to Indiana for their telemedicine visits with me. I’ve even had patients fly from their home state to a state I am licensed in so we can work together.

When it comes to using CGMs, look for experienced guidance. Seek a program customized for you: one that is created specifically for your situation and needs and which will be continually reassessed and fine-tuned by your provider as progress is attained.

Additionally, many metabolic-health docs like myself have other experts on staff to provide support to patients. I utilize both a team of nutrition coaches and personal trainers as part of our program support. They are checking on my patients weekly, in between my monthly patient appointments. They respond to patient inquiries, questions, or other needs within a business day, often sooner. They help me monitor my patients’ data remotely. This remote monitoring and weekly support allow us to be proactive in reaching out to our patients if their CGM data suggests intervention is needed or even if their data is good, but they would benefit from more frequent contact.

And a word about the support staff involved in your care. I believe you should work with a nutrition coach or nutritionist with specific expertise in low-carb diets and reversing insulin resistance. Not all nutritionists have been trained extensively in this approach. Many still emphasize a calories-in-and-calories-out model as opposed to a hormonal model in which insulin resistance is central to the treatment approach. Additionally, your trainer needs to be able to provide guidance on strength training for the purpose of increasing muscle mass to decrease insulin resistance (See Chapter 8.). I believe a particular area of expertise for a trainer is to be able to take a person who has never done resistance training and guide them effectively in this process as they progress, for example, from body weight and band exercises to free weights. I am fortunate to have support staff with a deep knowledge

in these areas. But, of course, I selected my team not only for their expertise but also for their passion to help people achieve results as part of a low-carb metabolic-health plan.

CGMs are great, but they're not magic. You can't slap one on and have the pounds automatically melt off your body. You need a program, an experienced provider, and knowledgeable staff to guide your effort.

Even so, continuous glucose monitoring has made it simpler than ever to improve your health. CGMs are easy and accurate to use. And the ability to see your data in real time makes these devices a worthwhile purchase, even if your insurance doesn't provide complete coverage. There is really no risk to trying one. No downside. As part of a structured weight-loss and metabolic-health program, a CGM is a powerful force multiplier. If you need to lose weight, have metabolic health issues, or even the potential for these issues as you get older, there's little reason not to at least try such a beneficial device. Like nearly all my patients, the likelihood is you'll be hooked.



## CHAPTER 4



### HOW TO INTERPRET YOUR CGM DATA

**N**umbers don't lie. But if we don't fully understand what they're saying to us, those numbers may not be very useful. If we don't have good insight into the meaning of data, like CGM data, this data is not as helpful as it could otherwise be. Let's talk about how you interpret your CGM data.

We've established that data from a CGM can be invaluable to making sustainable, life-changing health improvements. But that is only if you and your physician interpret your data correctly and apply it. Suppose you are a patient in my private practice, and we are reviewing your data curves. These can be seen either right in the app on your phone, or in your Freestyle Libre account on the computer. This is the output of your CGM. There will likely be some spikes and perhaps even persistent elevations in your blood-glucose level, but no two people's readings are alike. Your age, your diet, your workout and fasting regimens, your current medical conditions, and even your genetics will affect your glucose patterns. With each of my patients, we discuss in detail what this data means, how their program can

be customized based on it, and what action they need to take to lose weight and improve health.

During that first two-week trial period of CGM use, we evaluate the highest levels of blood glucose (spikes) both in terms of absolute peak numbers and how long that elevation lasts. We also look at patterns—is variability gradual or abrupt? Is it occasional or frequent? I tell patients not to change their current diet during this phase so we can obtain a true picture of how their usual diet affects their numbers. We also do lab tests during this time, the most important of which being a fasting insulin level to help determine their HOMA-IR. After two weeks of data collection, we transition from a diagnostic phase to dietary and lifestyle intervention using the CGM as a guide and behavioral tool.

Let me give you an example of the CGM evaluation of a typical new patient. This includes one additional important variable we follow—blood glucose average. Maybe initially, the blood glucose average for this patient (average level over many days) is high—say, in the 130s. We then put a diet plan together to bring that average consistently under 115 as an initial goal. Once we achieve that goal, we may then target a goal of an average of 105. It is this type of periodic goal setting, goal attainment, and progressing to a new target that we use to make sustainable changes over time. We, in fact, move the goalpost but only with the patient's buy-in and only after they have already put points on the board.

We also set other periodic goals related to, for example, keeping blood-glucose spikes under a certain maximum level. Or altering the average glucose pattern (AGP) which is that twenty-four-hour pattern of blood glucose. For example, if the AGP indicates that blood glucose rises routinely in the evening, possibly because of excessive eating before bedtime, we then address that issue. A new AGP goal for that patient may then mean working on getting 90 percent of readings to fall into a limited range (say, 100 to 130) during the targeted three-hour period each evening. With this approach of multifaceted and periodic goal setting, weight nearly invariably comes down. My patients also get positive reinforcement from other sustainable changes—lab numbers, workout improvements, even clothes fitting better. It's not willpower or motivation alone that helps them, but a system they followed—a system you'll learn about in full in Chapter 5.

In this chapter, focused on teaching you how to interpret your CGM data, we will use a case study approach. Looking at particular cases and learning from them is a common approach in medical education, and I have found it effective when educating my patients about common CGM patterns. Let's learn what CGM data may look like for a wide variety of patient types and how that data can inform and reinforce life-changing health behaviors. Because when the numbers tell us what is working, and patients see the result, many feel it is almost impossible to stop progressing toward their goals.

In each of the examples below, you can see how continuous glucose monitoring helps different types of people understand what's going on with their bodies—and how to act on those numbers. All these cases are based on real Metabolic MD patients, whose names and details I've altered to protect their anonymity. We will start with the simplest case (metabolically healthy patient) and then progress to more complicated scenarios.

Let's begin.

## **CGM DATA: REAL-LIFE EXAMPLES HOW TO USE A CGM**

First, as we look at blood-glucose patterns, it is important to understand that each person starts from a different place. If we are talking about a twenty-six-year-old health-obsessed person looking for fine-tuned metabolic fitness, that person is at a different point than a fifty-eight-year-old obese and hypertensive patient who wants to stave off diabetes.

Of these two examples, one patient's efforts aren't more praiseworthy than the other's. The younger, fitter person will likely have health goals that are, in a relative sense, easier to obtain. Doing so and staying on track (with the help of continuous or even periodic CGM use) will enable this person to live a longer, healthier, and likely happier life. But the older, less fit individual can still make great inroads to avoid conditions like diabetes, heart disease, and kidney disease. The gain for the fifty-eight-year-old can be relatively greater and likely even more impactful to their future health and longevity.

We will look at absolute numbers from a couple of scenarios involving real patients. We'll start with that young, healthy patient looking to

further fine-tune their health. We will then progress with these examples to the more common metabolic syndrome–type patients who usually fill my schedule. Quite honestly, it is these patients I find the most satisfying because, working together, we are literally able to change their lives and their futures. My practice is built to serve this population.

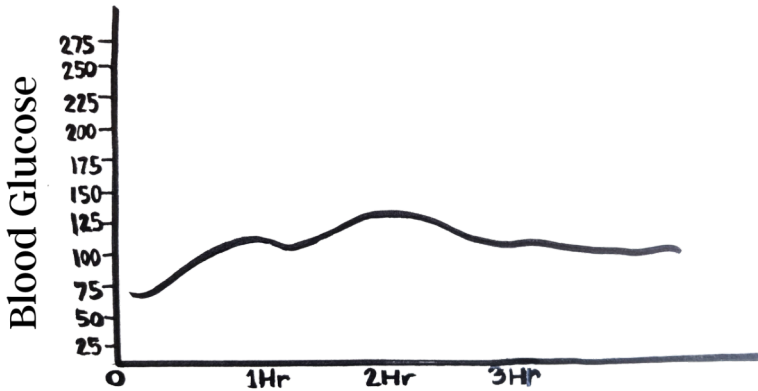
The first case study focuses on a patient with no insulin resistance or weight issues. Such a patient seeks dietary advice for metabolic fine-tuning, not management of a current or imminent health problem. This example is provided simply to convey the far end of the spectrum, the already-healthy patient seeking optimal metabolic health. Again, this type of patient is a very small percentage of my practice, but the example communicates a potential optimal level of metabolic health, an ideal to keep in the back of our minds. I will say, because of the technological focus of this younger population, although still a small percentage of my practice, increasing numbers of patients of this type are interested in the value of CGM.

As mentioned, overweight, middle-aged patients are the most common types of patients I care for. These patients can be categorized into two types. The patients in the first category do not yet have any super-serious health problems, but are overweight, and may have early issues such as borderline high blood sugar or mild hypertension. They may not know it, but these patients likely already have insulin resistance and are at high risk of progressing to metabolic syndrome. Then we have the full-blown metabolic syndrome patient seeking help to reverse prediabetes, hypertension, and high lipid levels. These patients invariably are interested in losing a significant amount of weight. And they will need to do so to reverse the significant insulin resistance they have already developed.

I'll include in this second category a subset of patients who have already progressed to diabetes and have multiple comorbidities. These comorbidities might include fatty liver disease, GERD, bone and joint issues, and/or sleep apnea. For many of these patients, we are able to reduce their diabetic and other medication use as they lose weight while improving blood sugar. We can also reverse the severity of issues such as hypertension and often even completely eradicate some of those comorbidities.

## CGM Data Example 1: Totally Normal (Actually Better Than Average)

This first case is the very health-conscious individual who has embraced a low-carb diet and hits the gym five or six days a week. This patient sets rigorous physical fitness and health goals. These types of patients are usually in their late twenties to early forties. They believe that an optimal fasting blood sugar should be between 70 and 85. Some research has shown that, in fact, this level of fasting blood glucose may be an appropriate goal in terms of both longevity and long-term avoidance of insulin resistance. These patients want to spend the majority of the day with blood glucose under 100. Their usual goal is that blood glucose spikes after meals should seldom be above 120.



*CGM curve of a healthy person with no insulin resistance after eating a meal with moderate amount of carbohydrate (100 grams of a mixture of refined carbohydrates and sugar). Rise in blood glucose is limited, returning to baseline (low normal) after several hours.*

Most people can't achieve these numbers. Only healthy people who keep rigorous low-carb discipline and spend a lot of time in the gym usually can. Also, these individuals need to be genetically blessed; most do not have diabetes in their family, so their risk of insulin resistance is low.

Now let's look at more typical patient types who would benefit from a CGM program.

## **CGM Data Example 2: Looking for Improvement**

Frank is thirty-eight years old. He is married, with a four-year-old girl and a new baby boy. He traditionally has been physically active since playing sports in high school. But in the last few years due to his busy work schedule he has not been able to work out regularly. Although Frank is about twenty pounds above his ideal weight, he has no known health problems.

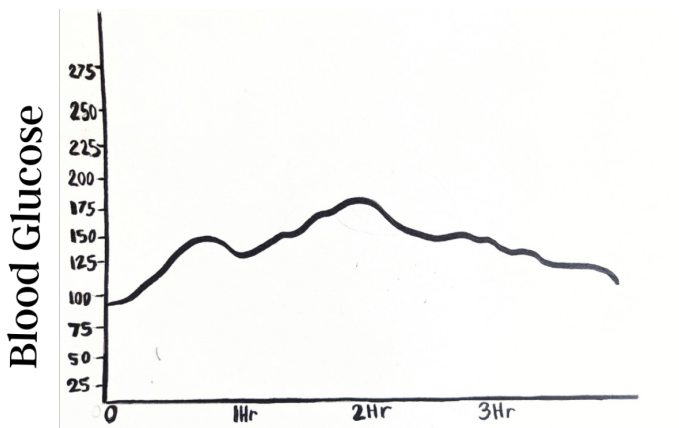
However, Frank is a little concerned about his future health because his mom developed diabetes recently. And his overweight father has needed a couple of cardiac stents. Both parents are in their early sixties.

Frank doesn't have a primary care doctor, but he got some labs done at his company's recent wellness fair. His fasting blood glucose was 98, and his A1C was 5.6 percent. Both are at the high end of normal. His cholesterol and triglycerides are just a little bit high too.

Frank wants a better understanding of his blood sugar patterns and to lose those twenty pounds. So he makes an appointment with a metabolic-health physician who prescribes CGMs as part of a comprehensive metabolic-health program.

Frank is prescribed a CGM and is asked not to alter his eating habits for fourteen days while data is collected. He complies with this request, and the provider obtains a good understanding of his blood sugar levels and patterns during this period. His fasting blood sugar stays in the mid- to high 90s on most days. After a carb-rich meal, a Guinness, and some ice cream for dessert, his blood sugar spikes to 172. These changes are typical for him on most days during his first two weeks on the CGM.

A blood-glucose level over 160 after a meal is often considered to be in the prediabetic range. So though Frank's fasting blood glucose and hemoglobin A1C border on prediabetes, his periodic blood-glucose spikes suggest he is pretty much there. And about that fasting blood glucose: though his blood sugar from the wellness fair was 98, on occasional days, his CGM early-morning blood glucose was in the 100 to 105 range. This is yet another advantage of a CGM. Instead of obtaining frequent AM blood draws or needing to check blood glucose as part of a formal glucose-tolerance test, Frank gets to see both his early morning and his after-meal numbers every day.



*CGM curve of a patient with insulin resistance after ingestion of a meal containing 100 grams of carbohydrate. Blood glucose rises to normal levels (greater than 160), and returns to a fasting level of around 100.*

More and more researchers and metabolic-health providers are reaching a consensus that by the time fasting blood glucose reaches 100, insulin resistance is well underway. Many believe insulin resistance may have been present and progressing for years at this point. These experts believe that ideal fasting blood sugar should be much lower, likely near 85, as mentioned in our first-case scenario. A level in the 80s means there is little likelihood of insulin resistance currently or in the near future.

Medical researchers have studied thousands of young, healthy patients to evaluate morning blood-glucose levels. They found that a truly normal fasting blood glucose is really in the 85 to 90 range or lower. Patients without any insulin resistance (HOMA-IR less than 2.0) seldom have a fasting blood glucose above 90. This means that patients with fasting blood sugar in the low 90s range may very well be beginning to have some early insulin resistance. Those with a fasting blood glucose in the mid- to high 90s almost certainly have at least limited insulin resistance brewing, putting these patients at risk for future prediabetes and diabetes.

If you consider the carbohydrate-rich diet typical of US adults over the last fifty years, this expert consensus is not surprising. I am certain our present day fasting blood-glucose levels are higher than those of our ancestors, who ingested a higher percentage of protein and fat. This is one

reason I and others often refer to the high-carb Standard American Diet with the acronym SAD.

So Frank's fasting blood glucose of 98 means he likely has an underlying insulin resistance problem brewing. His morning CGM numbers also suggest this. That puts him at risk of diabetes. But what about his blood-glucose spike to 172 after his big meal?

The traditional thinking is that blood vessels start to suffer damage when blood glucose is above 140. To be sure, if blood-glucose levels are 140 or higher on a recurrent basis, blood vessel linings are already being affected. This, of course, can be a prelude to vascular disease later in life. The belief is that the more time your blood glucose is at the 140 or higher level, the more blood vessel lining damage may be occurring: little or minimal damage if only occasionally above 140, progressive damage if more frequently above 140 and there for longer periods of time.

The same studies that demonstrate optimal fasting blood sugars from 70 to 85 in healthy people without insulin resistance also indicate that healthy people seldom have post-meal blood glucose above 140. In fact, many people in these studies very rarely have blood glucose above 130.

And Frank's blood-glucose variability can be an independent predictor of risk for diabetes and other chronic vascular diseases like stroke, heart disease, and kidney failure. This means that not only are the absolute high blood glucose numbers a problem, but his bouncing around from about 100 to the 170s, and back down again is also an issue.

Frank, based on his CGM data, his fasting insulin level, and his HOMA-IR calculation is found to have insulin resistance. This is not surprising with his significant family history of metabolic disease. His metabolic health provider puts together a regimen for him that includes a low-carbohydrate diet (35 to 50 grams per day). Frank, at his doctor's recommendation, also institutes an intermittent fasting regimen of twelve hours a day from 7:00 p.m. to 7:00 a.m. After a few months, he gradually increases his fasting time to sixteen hours three or four days per week. Fasting, along with his low-carb diet, decreases sugar absorbed in the gut. As a result, his blood-glucose numbers come down. This change also helps tamp down his level of insulin resistance.



His provider also suggests getting back to the gym, with an emphasis on strength training. Strength training also helps with insulin resistance by increasing the effectiveness of muscle insulin receptors, helping those muscles soak up more insulin and, of course, blood glucose.

With this comprehensive new regimen, Frank's blood glucose now never spikes above 140. His morning fasting numbers drop to the low 90s. Cholesterol stays about the same, but triglyceride and HDL numbers improve. He effectively reversed his prediabetes—he is no longer prediabetic. He has mitigated potential progression to diabetes, the disease his mother is now struggling with.

And, by the way, Frank lost those twenty pounds in the first three months of his metabolic-health program.

### **CGM Data Example 3: Oh No, Metabolic Syndrome!**

Full blown metabolic syndrome affects about 30 percent of adults in the US. (But, as we have discussed, about 85 percent of American adults have at least one metabolic-health risk factor.) Metabolic syndrome places people at higher risk of diabetic complications, cardiovascular disease, stroke, and other diseases related to atherosclerosis. (Remember, atherosclerosis is hardening of the arteries, or artery blockage caused by artery plaque buildup, affecting both large and small blood vessels.)

Our next case is that of a metabolic syndrome patient. This is the most common type of patient who seeks help in my metabolic health practice.

Our metabolic syndrome patients seek a number of likely goals:

- Lose weight (usually midsection or “visceral” fat).
- Decrease high blood-sugar numbers. This may include reversing the prediabetes state or, in diabetic patients, improving blood-sugar control and lowering diabetic medication requirements.
- Improve blood pressure and blood-lipid levels.
- Reverse numerous symptomatic other conditions like GERD, sleep apnea, fatty liver disease, PCOS, and even knee and back pain related to increased weight.

Rosalyn is a forty-six-year-old who was fit in her twenties. But with two pregnancies, full-time work, and the stresses of balancing kids and career, she has gained about 45 pounds. She is now tipping the scales at

about 185 pounds. She has a good marriage, the kids are doing well, and work is enjoyable, if challenging. She does a good job balancing all her responsibilities. But she is very worried about her weight and her health.

At her annual physician checkup, her blood glucose was in the prediabetic range. She needs several meds to keep her blood pressure under control, and her doctor started her on a cholesterol medication as well. She has always been active, but in recent years she has less energy and now often naps after work. This frustrates her because she wants to be spending evenings with her family and maybe even get a workout in a few times per week. At that last doctor visit, she was told to “eat less and exercise more.” The doctor really did not offer her a plan for weight loss or reversing her conditions. It appeared that her provider’s long-term plan was to continue adding medications to treat her issues, rather than getting to the root cause and reversing those pathological processes.

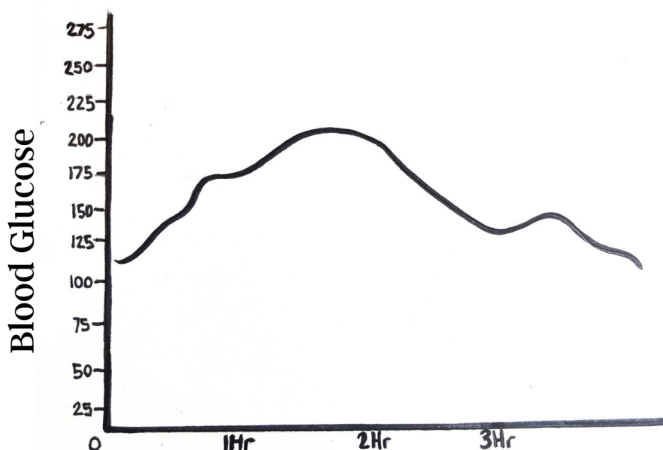
Rosalyn seeks out a metabolic-health physician to help her lose weight, improve her blood-glucose numbers, and see if she can lower her blood pressure and cholesterol with diet and lifestyle changes. Her goal is to have this new physician with expertise in weight loss and improving metabolic health complement her primary care doctor.

She likes her PCP but is not getting what she feels she needs from her to alter the course of what she views as her gradually deteriorating health. Though the doctor truly appears to care about her, she does not appear to have the expertise or time (in that short twenty-minute visit) to help Rosalyn make the lifestyle changes that could help her reverse her health problems.

At the time of her first visit with her metabolic-health provider, routine labs are ordered. They come back showing fasting blood glucose of 111 mg/dl and A1C at 5.9 percent. (A normal A1C is under 5.7 percent.) Both tests indicate prediabetes. Her cholesterol and triglycerides are slightly elevated. But the biggest concern is a fasting insulin level of 18. This gives her a HOMA-IR of 5.2. (Normal is less than 2.0.) So insulin resistance is well underway.

Her CGM during her two-week trial (with her consuming her usual diet) shows post-meal blood-glucose spikes as high as 195 (over 160 is considered high), and her average daily glucose hovers around 125 (also

high). Her morning fasting equivalent numbers are usually in the 110 to 115 range. The doctor has her log her carbohydrate intake for a couple of days during the end of the trial period. Her daily carb intake is found to be quite high, around 300 grams per day. This is not surprising as she has been told to watch her fat intake and has been eating the high-carb Standard American Diet (remember SAD) for years.



*The CGM pattern of a metabolic syndrome patient (prediabetic, bordering on diabetes) after a moderate carbohydrate meal of 100 grams. Blood glucose never drops below 100, and blood glucose spike is nearly in the diabetic range of over 200.*

Rosalyn is counseled to limit her carb intake to 75 grams per day. She is a little apprehensive about a daily carb limit lower than this. However, a lower goal will be set after she adjusts to this 75-gram level. Later on, the goal will be set at 35 to 50 grams per day, with the implementation timeline for this lower goal dependent on how she adjusts to her new diet. Her CGM data will be considered in setting these targets. This approach helps ensure that the targets are sustainable so that Rosalyn is able to progress toward her goal of substantial weight loss.

The progressive targets also assist her efforts to lower her fasting blood sugar and intrinsic insulin level, which, in turn, lowers her insulin resistance and HOMA-IR. Rosalyn is not told to lower her overall calorie intake. Nearly the entire focus of her dietary modification is on decreasing carbs. This means she is eating more fat and protein. She is OK with her increased

fat intake, as the doc has explained her insulin resistance is a much bigger threat to her long-term health than her cholesterol level.

She gets the hang of using the “Cronometer” app on her phone and her kitchen scale to count her carbs and macronutrients. She actually finds she enjoys knowing exactly what she is eating. She learns to avoid added sugar almost altogether and learns about good fats and bad fats. She starts using more olive oil in cooking and finds she enjoys salmon a day or two a week. What she really likes is that she can always eat something; she just needs to watch her carbs.

Able to eat much more fat, and as much protein as she wants, Rosalyn reaches food satiety much earlier and more often than before. As we will discuss in the next chapter, fat helps you feel fuller longer, in comparison to carbs. She is not nearly as hungry in the afternoon and evening as she used to be, and her snacking between meals is all but eliminated. Caloric intake drops, without any specific plan to target lower calorie ingestion. She drops her daily carb intake to under 50 grams. Many days, she is closer to 35 grams.

At three months, her metabolic doctor re-checks her lipids. Despite her increased fat intake, her cholesterol stays about the same, and her triglycerides improve. Her HDL or “good cholesterol” actually goes up, improving her overall lipid profile. (These lipid profile changes are typical of an overweight person on a low-carb, high-fat diet.) One reason these numbers improve is that after just ten weeks on her metabolic-health plan, she has lost twenty pounds of midsection fat. She tells her doctor in a matter-of-fact manner, “This diet isn’t as hard to follow as I thought it would be.”

The CGM she was provided gave her great behavioral feedback on her diet. This is true in terms of both guiding her diet and providing reinforcement of the lifestyle changes she is making. Her spikes initially were a little scary, and she now feels a sense of accomplishment because her highest spikes after meals now are under 140, with most under 130.

Her fasting glucose is also coming down, as is her average daily glucose. Her fasting glucose (early-morning reading from her CGM) is now frequently under 100. Her average daily CGM glucose now is consistently about 105 (it was previously about 125).

Along with losing weight, these objective changes provide positive feedback she can build on.

Knowing that her metabolic physician and nutrition coach are monitoring her blood glucose remotely gives her some additional drive as well. She likes knowing that someone is keeping an eye on her numbers as it provides her a little more motivation to achieve her daily carb goals. And she likes the weekly telemedicine sessions with her nutrition coach, both in terms of keeping her diet on track and in terms of building her knowledge base on a low-carb lifestyle. Her coach has shared a number of low-carb meal recipes with her, and she is finding her family enjoys the meals she now prepares as much as the high-carb dinners she used to make.

As Rosalyn makes progress, two other techniques are introduced. The first is intermittent fasting. Rosalyn compresses her meals and snacks into an eight-hour period between 11:00 a.m. and 7:00 p.m. five days per week. She had never tried to do any sort of fasting in the past, so she started with a twelve-hour overnight fast but easily progressed to a sixteen-hour fast on almost a daily basis. When she goes out to dinner, has breakfast with her husband on weekends, or if there is a special occasion, her fasting period is shorter. However, these shorter fasts usually occur just once or so per week. She does not feel her fasting is an intrusion on her life as she has been told by her provider it is fine to do shorter fasts once or twice a week. She likes this flexibility. Her fasting, along with her low-carb diet, further helps decrease her insulin resistance.

Rosalyn also starts working out for the first time in years, starting with walks but soon progressing to using the elliptical and the treadmill at the gym. For her cardio workouts, her doctor asks her to follow the American Heart Association guidelines for cardiovascular fitness by initially getting to 65 percent of her maximum heart rate for 150 minutes per week. Eventually, she will progress to getting to 80 percent of her heart rate max and then will only need to be on the cardio machines for a total of seventy-five minutes a week to meet the AHA requirements.

At her doctor's suggestion, she also begins low weight resistance training to increase her muscle mass. Rosalyn knows that if she can increase her muscle mass, her muscles will soak up more insulin and glucose and help improve her blood-glucose numbers further. She now has the energy to do

those end-of-the-day workouts a couple of times a week and at least once on weekends.

After five months of losing weight and improving her CGM numbers, Rosalyn is instructed to do some carb cycling. Though she has made great progress, sometimes the rigorous carb intake goal of just 35 to 50 grams is a little hard to maintain. So she works with her doctor and nutrition coach to liberalize her carb intake for limited periods.

For example, after about three months at 35 to 50 grams per day, Rosalyn's carb limit is bumped to 75 daily grams temporarily. This gives Rosalyn a little mental break, and 75 grams, after being at 35 grams, now feels almost like her previous intake of 300 grams. Some days, she doesn't even get to 75 grams. After a few weeks, she goes back down to 35 to 50 grams and continues her weight loss and metabolic-health progress. Her goal of losing thirty-five pounds is not only in sight; she's confident she can get there and stay there.

After returning to the lower daily carb goal for a few weeks, she loses another five pounds, and her fasting blood sugar (morning CGM reading) is, for the first time, consistently near 95.

Rosalyn continues this process for another three months. She reaches her thirty-five-pound weight-loss goal, feels better, and has much more energy. She pulls some of her old clothes out of the attic as she is now "drowning" in some of the larger-size clothes in her closet. She jokes with her metabolic-health doctor, "You're costing me money" because she also needs to go out and buy some new clothes for work. Her family, friends, and coworkers notice a change in her appearance, energy, and attitude. She feels she has less brain fog. Her metabolic-health doctor orders a new set of labs. Her repeat A1C is 5.3 percent. Her insulin level has dropped to 8, and at the time her labs are drawn, her fasting blood glucose is 93. Her new HOMA-IR, the calculation of her level of insulin resistance, is now down from 5.2 to 1.9, indicating she is below the cutoff for any significant level of insulin resistance. Lipids are checked again, and the numbers she had three months ago are actually further improved. At her next primary care doctor visit, she is taken off one of her blood pressure medicines, and the cholesterol medicine is stopped as it is no longer needed.

Her primary care doctor is impressed and calls up the metabolic-health provider to learn more. The PCP wants to implement some of this regimen (the low-carb diet and intermittent fasting) with some of her own patients. She also plans on referring more patients who need a lot of support to the metabolic-health provider.

### **CGM Data Example 4: Is It Too Late?**

I have cared for tens of thousands of diabetic patients in the ER over the years. Often, they come in with a complication of their diabetes: neuropathy, an infection, a foot-circulation issue, kidney failure, or some other serious vascular issue like a stroke or heart attack. Before these patients showed up in the ER, their diabetic disease management plans consisted mostly of simply adding more medications to control blood glucose and higher doses of those medications. This was done in an attempt, often unsuccessful, to mitigate the organ damage caused by persistently elevated blood glucose. Only occasionally were diet and lifestyle management central parts of the patient's medical management. Unfortunately, though most of these patients knew their blood sugar was an issue, they really did not understand the relationship between their carb intake and their disease. I believe this lack of understanding is not always their fault as many have not been properly educated on this connection. In a health system focused on treatment with medication rather than prevention, disease avoidance is not always a priority. Many of these patients started on oral medication for diabetes and then progressed to requiring insulin. Yes, many diabetics do need medication to help control blood glucose, but drugs should be used alongside a lifestyle plan to help control blood glucose and limit the need for medication as much as possible.

We have discussed how the standard yearly blood-glucose assessment of patients consists of a fasting blood-sugar test and an A1C. Once the numbers are obtained, the management approach is most often limited to medication adjustments. Primary care providers pay some attention to diet, but most providers lack the time to provide in-depth nutritional counseling, set daily carbohydrate targets, and track those with their patients, much less to help their patients implement a fasting and strength-training plan.

Though doctors may refer patients to nutritionists, studies have shown that patient follow-through with a sustained nutritionist-guided plan (one

not integrated into a medical treatment plan) is limited. There seems to be a disconnect, in such cases, between medical management and meaningful lifestyle change. Many diabetics are not fully aware they can often reduce medication needs with a low-carbohydrate approach. They don't completely understand this will help lower insulin resistance, improve blood glucose, reduce medication needs, and achieve weight loss.

And many nutritionists, I believe, need to take a more rigorous low-carb and fasting approach with their diabetic patients. In my experience, it is only an aggressive low-carb approach, usually 50 grams of carbohydrates or less per day, that achieves success, defined as lower blood glucose, weight loss, and reductions in medication requirements. Sometimes an even lower target must be realized to achieve meaningful results. Most nutritionists take a more moderate approach. And though they do address carb intake, calories in and calories out sometimes receive equal billing. This is true even in the nutritional education of advanced diabetics—the patients I believe benefit most from an aggressive low-carb approach.

Only about 15 percent of Type II diabetics need insulin. Most patients who are on insulin have been diabetic for some time. They have usually not been successful at weight loss, and because of progressive insulin resistance, most have gained weight since their initial diagnosis. This is because progressive insulin resistance results in persistently higher blood glucose, which, for reasons we have previously discussed, makes losing weight increasingly more difficult. Very few diabetics, in my opinion, have been on an appropriately aggressive low-carb diet: a diet that might help them prevent the typical scenario of progressive weight gain and higher and higher medication requirements.

Many diabetic patients are on one or even several types of non-insulin diabetic medications to keep blood sugar under control. Most of these are oral medications, but in recent years, some self-injectable non-insulin medications that lower blood glucose effectively have been developed. These medications can not only lower blood glucose but also help with hunger and weight loss.

I support the use of a class of these medications as they are effective in achieving good blood-glucose control and improvement in other metabolic-health parameters. This class of medications is known as the “GLP-1



Agonists”. We will spend an entire chapter talking about semaglutide. Semaglutide has the brand name Ozempic. (Remember the TV commercial: “Oh, Oh, Oh, Ozempic . . .”?) This medication was found to be effective in achieving weight loss in diabetics, and this same medication is now marketed for weight loss for nondiabetics as Wegovy. Semaglutide has its place in the management of some metabolic syndrome patients, even if they are not diabetic. However, this is a medicine, in my opinion, that should be used as an adjunct for weight loss once dietary and other lifestyle changes are in place. For nondiabetic patients the intent should not be to start a patient on this medication and have them require it for life. There needs to be a diet and lifestyle plan put in place so discontinuation of the medicine can eventually be achieved. This being said, semaglutide can offer an effective boost while new lifestyle habits are being engrained. More on semaglutide in Chapter 9.

Unfortunately, diabetics are often provided progressively more medications, added incrementally over years, without adequate guidance regarding lifestyle interventions. The scenario is often quarterly or twice-yearly doctor visits in which the only management approach is increasing doses of medicine or adding new medicines.

Newly diagnosed diabetics are most frequently placed on Glucophage (metformin), then, as needed, the dose of metformin is increased to help control blood glucose. Other classes of medications (sometimes multiple different classes) are added if the maximal dose of metformin is not keeping blood glucose in an acceptable range. If blood sugar is still not controlled to keep fasting blood sugars and A1Cs at the desired level, insulin is then added. Unfortunately, focused discussion on lowering dietary carbohydrates and setting specific low-carbohydrate targets is rarely part of the package. As mentioned previously, in my experience, tragically, some diabetics don’t really understand the connection between excess carb intake and their diabetes.

Diabetics are not predestined to require high doses of metformin, multiple medications, or even insulin. Much of the need for medication is within the patient’s control. It is possible for diabetic patients to reverse the need for medications, including insulin, many years after their initial diagnosis of diabetes.

This does not mean that these patients are cured of diabetes. They still have the underlying disease. However, they have returned their blood glucose and insulin physiology to near normal. With proper diet and weight management, that status can be maintained for years. The need for reintroduction of medication for treatment of their condition can be delayed until blood glucose again rises to abnormally high ranges.

Almost no insurance companies will cover CGMs 100 percent for patients who are not on insulin. In addition, most primary care providers will not prescribe CGMs for patients who aren't on insulin. Insurance carriers, and the docs too, mostly believe that CGM is only for determining how much insulin a person should use. One physician I had a discussion with about my success using CGMs in nondiabetics, prediabetics, and diabetics not on insulin bluntly said to me:

Continuous glucose monitoring has no value in a diabetic population not requiring insulin. And is certainly worthless in prediabetics. The data provided by the CGM has no value unless it is used as actionable information in terms of guiding insulin dosage. It is not an educational tool to guide diet or lifestyle.

Of course, he also voiced his opinion that prescribing a CGM to a nondiabetic without prediabetes was also of “no value” and a waste of money. I could not disagree more. I now have many years of experience to back up my belief that CGM is beneficial for nondiabetics, prediabetics, and diabetics alike. In many cases, this tool literally changes people's lives. (See Chapter 10: How Continuous Glucose Monitoring Changes Lives.)

The management process for diabetics at Metabolic MD is similar to that of our other patients, with one major additional caveat—we take extra care to make sure that patients on medications that lower blood glucose avoid episodes of hypoglycemia. Diabetics on metformin and GLP-1 agonists like Ozempic (semaglutide), Trulicity, Monjaro, or Saxenda can usually lower their carb intake and not worry about hypoglycemia. This is because these medications control blood glucose but very rarely cause low blood glucose. (This is also why semaglutide can be prescribed for weight loss and improved metabolic health safely for use by nondiabetics.)

For patients on medications that can cause hypoglycemia, such as Glipizide, Glyburide, or Prandin, extra care must be taken. Those who are

on insulin alone or in combination with these medications are at greatest risk for hypoglycemia. So CGM numbers need to be monitored closely as carb intake is reduced. Nearly all these patients achieve reductions in medication amounts and in insulin dosage as their carb intake is brought down.

Reducing carbohydrate intake in a coordinated manner can lead to remarkable reductions in the need for medication. Often, as noted, this occurs with improved CGM blood-glucose numbers.

I have not had any issues with hypoglycemia in my diabetic patients as we lower their carb intake and reduce their medication needs. But I take extra effort to help my diabetics manage this process carefully. I have also found that the diabetic patients who come to me are very knowledgeable about their disease and have a good sense of how much insulin they require in the face of progressively reduced carb intake. Though hypoglycemia is definitely a risk, the CGM allows for the necessary monitoring to achieve this medication reduction goal safely. Many patients recognize not only the health impact of this improvement but also the positive financial impact of needing to purchase less medication. (Insulin is expensive!)

Let's conclude this discussion by reviewing a short case study of one of my patients.

Janette came to us wanting to lose about forty pounds. Now sixty-two years old, she had been diabetic for seven years and was taking metformin and insulin. Some other medications had been tried before she was started on insulin, but because of side effects, they were discontinued. The insulin was then started. In the evening, she would take long-acting insulin, which she would supplement with fast-acting insulin during the day before each meal. Despite this medication regimen, her blood glucose often spiked over 300. Her daily blood-glucose average, based on her CGM, was initially around 150. She could not recall ever having received any meaningful education on reducing carbohydrate intake.

For this patient scenario, no typical blood-glucose-over-time graph is provided as was for the other case studies. Insulin use grossly alters CGM patterns, so there is no typical pattern for this type of patient.

Just through experience, however, Janette had developed a good understanding of how her carbohydrate intake and her insulin regimen affected her blood sugar.

Despite this, for years, she had chosen to eat pretty much whatever she wanted, and she just adjusted her insulin dosage upward accordingly. This is not an uncommon approach for many diabetics.

Her physician encouraged this adjustment to avoid very high blood glucose but never really talked with her about how a coordinated reduction in carb intake could help her lower her blood glucose and help her require less insulin. The topic of prescribing a CGM had never come up. At one point, her doctor did refer her to a nutritionist who was focused on an “exchange” system of dieting. She felt that the system was a bit complicated, and following it was difficult. She told me that the connection between daily carb intake and the use of exchanges was never super clear to her. She also did not understand that her persistently high blood glucose ultimately resulted in weight gain as that excess glucose was eventually converted to visceral fat.

With her increased blood glucose and increasing insulin resistance, she had also gained weight. Janette had held her weight under 155 pounds through menopause, but with her diabetes, she had gained 40 pounds over the last seven years. Janette was concerned about her health, but she also expressed concern about her energy levels and even dissatisfaction with her appearance. She had never been this overweight, and she did not like it. In her words, “This isn’t me.”

We started Janette on a relatively high 100-gram-per-day carbohydrate diet, watching her blood-glucose levels with her CGM. But she adjusted to this diet very quickly and was soon able to reduce her short-acting insulin significantly. We then brought her carb limit down to 50 grams per day. Within two months, she was able to eliminate her short-acting insulin completely with better blood-glucose control. Her blood sugar then seldom rose to over 180.

As Janette began to lose weight, she was also able to reduce her long-acting insulin. Within four months, that requirement went from 60 to 40 units per day. Her blood-glucose control was the best it had been in years, with pre meal readings often about 100 and post meal glucose readings seldom above 160.

In effect, Janette had reduced her insulin dosage requirements by over 50 percent, with much better blood-glucose control. I congratulated her on

how she had greatly reduced her eventual risk of kidney failure, neuropathy, and other diabetic complications. She also reached her weight-loss goal. After six months, she was back down to 155 pounds.

Janette's experience is not unusual for our diabetic patients who focus on diet as a primary method of blood-glucose control. However, to achieve medication reductions while controlling blood glucose, a carb goal needs to be carefully targeted, and in my opinion, a CGM should be utilized to guide diet. This is essential to balance carb-intake targets with medication amounts (oral medications and insulin). It also allows diabetic patients to avoid hypoglycemia as their carb intake is reduced.

## INTERPRETING CGM DATA—THE BOTTOM LINE

In this chapter, I have provided several treatment scenarios and associated CGM graphs of patients with various levels of insulin resistance. A logical next question is, "How then are these graphs altered when carbohydrate intake is lowered?" There are almost an infinite number of CGM curve variations based on a person's level of insulin resistance and the associated amount of carbohydrate ingested. Curves differ based on many, many variables. One variable, for example, would be the mix of sugar, complex carbs, and fiber in a given single food (for example, a fruit). Of course the macronutrient mix of an entire meal greatly matters as well. Other variables include how quickly the food is eaten and even in what order several different foods are eaten during a meal.

A number of the most common of these scenarios are reviewed in a recently published book by Jessie Inchauspé, *Glucose Revolution*. I recommend this book as it provides a useful understanding of the nuances of carb intake's impact on blood glucose.

As you can see, great changes are possible with a CGM. But just following numbers is not enough. Patients need to make data-informed lifestyle changes. This, of course, includes diet and carb intake, but other lifestyle modifications are important as well.

Next, in Chapter 5, we'll dig a little deeper into the important characteristics of the three macronutrients. We'll then begin to discuss

the other techniques and tools, over and above the food you eat, that will facilitate weight loss and improved metabolic health.

So now, let's go from reading the data to understanding how to act on it.

## CHAPTER 5



# DIET MYTHS, NUTRIENT TRUTHS, AND WHAT THEY MEAN FOR YOUR BLOOD SUGAR

**W**e've established that data alone is not enough to create lasting change. You must also have the correct data to work with—24-7 blood-glucose levels—and you need to know what to do with that data to achieve the transformation you are seeking. Now, that's the obvious starting point—to use data to change what you eat to improve your health and overall quality of life. And this is where most other diets get it wrong right at the beginning. They use the wrong piece of data—calories. And because the wrong data source is being utilized, you are told to eat the wrong foods and often told to eat those foods in the wrong amounts! You are told to eat foods that do not satiate (suppress hunger), and then you are told to limit how much of those non-satiating foods you can eat. For nearly every person with a high BMI, a diet should focus on lowering insulin resistance and blood glucose, not on calorie restriction.

So in this chapter, we'll dismantle popular food myths that doom most common dieting efforts. It's important to have your CGM blood-glucose numbers at your fingertips, but you also need to make the right decisions

with that data. CGM use is more than reading a graph full of figures and trying to have a go at things on your own. Sticking on a CGM and hoping for the best isn't a strategy. You need a specific diet plan—actually, a comprehensive metabolic-health plan—to go along with your CGM.

In the next chapter, we'll cover *what* exactly I advise our Metabolic MD patients to eat when following our program. For now, let's give you something just as important—the *why*.

## GLUCOSE FEEDBACK, REVISITED

Again, CGMs are behavioral tools that give you 24-7 feedback. As you eat and drink, you see which foods affect your blood glucose by raising it or keeping it relatively low. This feedback helps you drive toward the personal health outcome you are striving to attain. Remember, when blood glucose is lower, your muscles and other organs must find a new energy source. And lucky for them, one is close at hand. Fat—belly fat (visceral fat) in particular—is broken down into fatty acids to fuel the organs in place of blood glucose, ultimately reducing body weight. Less blood glucose means the pancreas does not need to work as hard at pumping out insulin. With less insulin in the blood, the body becomes more sensitive to the insulin that remains. This is the opposite of insulin resistance; it is increased organ insulin sensitivity.

In this way, the process that created insulin resistance—high blood glucose with more insulin released—is reversed. As insulin resistance is reversed, dropping pounds is facilitated. With less insulin resistance, over time, blood glucose remains more stable. Additionally, with this process, prediabetes can also be arrested before it progresses to diabetes. Even if diabetes is already present, it can be put in complete or partial remission.

## THE THREE-PRONGED APPROACH

As we've stated before, we don't just slap a CGM on you and send you on your way; effective use of this device requires a change in habits and a method for achieving that change. This approach, customized as a result of



working with thousands of patients, is a three-pronged program—**low-carb eating** (Chapter 6), **intermittent fasting** (Chapter 7), and **muscle building** (Chapter 8). (Yes, increased muscle mass reduces insulin resistance.) For some patients, we may also add the use of a new FDA-approved weight-loss medications. An example is Wegovy, which is the same medication as Ozempic, and has the generic name **semaglutide** (Chapter 9).

But why not just count calories instead? Because counting calories, in my opinion, is not sustainable. Not only is it virtually impossible to count calories for the rest of your life but also, not all calories are the same. For example, some will raise blood glucose, and others will not. And for the purposes of lowering blood glucose and giving you the energy, metabolic health, and the quality of life you desire, I believe a low-carb diet is by far the best method to provide you the result you are seeking. A low-carb diet, for many people, is a radical shift from what they are used to eating. After all, we have all been told—by the government, by health-care providers, and by the food processing industry—that a low-fat or reduced-fat low-calorie diet is the answer. This is just not true for most people.

You deserve an explanation of why a low-carb approach is both more effective and healthier. Buckle up; we're about to cover everything they never taught you about nutrition in your high school health class

## WHAT EXACTLY IS A “LOW-CARB” DIET?

Low-carb diets are what they sound like—diets that limit carbohydrates. While the target amount of a low-carb diet can range from 0 to 125 grams, the typical low-carb diet is usually between 20 to 75 grams of carbs per day. This is compared to the typical American average of about 300 grams or more per day. Remember, that is the SAD or Standard American Diet. Aptly named.

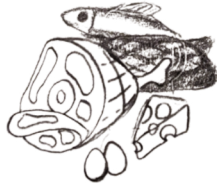
In my practice, I usually start patients with a target carb intake of about 35 to 50 grams each day. As you remember from our case studies in the previous chapter, occasionally, a higher target of 75 grams or even 100 grams is acceptable. The intent, then, is to move within a matter of weeks or a month or so to the lower range. I usually reserve the higher targets for a minority of “low-carb naive” patients: those who have never tried low carb

in the past. It is a minority of patients who have apprehension regarding starting at 50 grams per day or less. And they often surprise themselves at how quickly they move from a higher target to 35 to 50 grams.

As long as the patient counts carbs accurately, the low-carb plan put in place usually results in weight-loss progress and an improvement in metabolic health within a matter of weeks. Occasionally, it takes a little longer. A specific kind of low-carb diet called a keto diet limits carbs to 20 grams a day or less. But I do not recommend “going keto” to my new patients routinely, though 20 or 25% of my patients eventually do choose to go there for at least a limited period of time, and I support them when they do. Thirty-five to fifty grams per day is a good place to start and almost always results in initial weight loss.

I will mention that if a patient does choose to pursue a keto diet to achieve more rapid weight loss, I guide them in this effort while making sure they are doing it safely. I initially evaluate these patients to make sure such a diet is not harmful. For example, I recommend against keto for patients with compromised kidney function as higher protein intake may put their kidneys at risk of further compromise. On top of that, for patients who have not previously gone keto, I nearly always start them off on a moderate low-carb approach, then ease them into ketosis. I do have the occasional patient who has not been keto or low carb previously but has educated themselves about keto and wants to go full bore out of the gate. They want to jump-start the process. If they are insistent in not waiting a few weeks at 35 to 50 grams before going to 20, I show the flexibility to support them, and the vast majority do just fine.

Following a low-carb diet does not require you to be a nutrition expert. However, you do need to know what types of foods are full of carbs and which are not. It is also important to understand the major macronutrients (remember these are carbs, protein, and fat) and how each may affect your insulin levels and, ultimately, your weight. This chapter lays it out for you so that you can understand how to keep your blood glucose at a targeted level, avoid glucose spikes, and also avoid persistent elevations of blood glucose. These issues, as you know by now, will keep you from losing weight. Basic knowledge of each nutrient makes it clear why low-carb diets work.

**Carbohydrate****Protein****Fat**

*The macronutrient groups consist of carbohydrates, protein, and fat.*

## WHAT ABOUT FAT?

Most low-carb diets involve a higher level of fat intake because the carbs need to be replaced with another nutrient to provide energy. The Standard American Diet is 50 percent carbs, 30 percent fat, and 20 percent protein. A low-carb diet switches that to about 20 percent carbs, 50 percent fat, and 30 percent protein. So the low-carb diet approximately reverses the fat and carb percentages of the SAD and ups the amount of protein. These are approximate numbers, and these percentages can vary based on the specific type of low-carb diet being pursued. Why eat a diet high in fat? One reason is that fat packs the most energy of all the nutrients, with 9 calories per gram. Your body understands that, so you have a tendency not to overeat fat. It satiates.

So fat has a big benefit: it fills you up. Fat causes a relative decrease in the size of the opening of the pyloric valve, the valve between the stomach and the intestines. This means that your stomach stays fuller for longer. On top of that, special gastric hormones are released with fat ingestion. These hormones are released from the lining of the stomach and, once released, affect the hypothalamus portion of the brain. An example is the hormone

leptin. It is a signal to the brain to reduce hunger. A feeling of satiety occurs. Therefore, fat gives you a sense of fullness, reducing your desire to overeat. This means that you won't be looking around for another meal in just a few hours. Think about it. You can eat bag after bag of pretzels. But it's hard to overdo butter or even a well-marbled steak.

I believe that, for most overweight people, the potential damage from persistently high blood glucose and insulin resistance is a much bigger issue than potential damage from cholesterol. As explained in the previous chapter, for high-BMI people, cholesterol is not raised much by eating a higher proportion of fat. Since low-fat diets were thrust upon the American public from the 1970s onward, dietary fat has been vilified. Since that time, with Americans eating low-fat (that is, high-carb) diets we've experienced epidemics of obesity, diabetes, and the vascular disease associated with these conditions.

The scientific fact is that, for people with a high BMI, eating dairy products and fatty meats raises cholesterol only slightly, if at all. Eighty percent of cholesterol is manufactured in the liver, meaning only 20 percent comes from the direct ingestion of fat. So the amount of cholesterol consumed usually has a limited impact on blood cholesterol levels. This has been shown to be particularly true for overweight and obese people. This is what I see clinically in my practice over and over again. Cholesterol does not change much on a low-carb, high-fat diet if the patient's BMI is high to begin with.

The exception to this rule of increased dietary fat not raising cholesterol significantly are slender people. Many of them do have a more significant cholesterol increase from increased fat ingestion. Usually, there is a genetic component to this, meaning a slender person can be predisposed to this type of response based on their genes. But a slender person is not my typical patient. So, in my practice, this is a rare issue.

When I do have a slender patient who is just seeking improved metabolic health, not weight loss, we watch these numbers closely. If they rise, we back off on the amount of fat in their diet and sometimes I even refer these patients to a lipidologist—a doctor with expertise in the area of cholesterol and triglycerides. The need for me to make such a referral is very rare.

For the vast majority of my patients, a mildly elevated cholesterol level doesn't pose the risk that elevated blood glucose and insulin resistance do. Remember, elevated blood glucose goes to the liver and is eventually converted to fat. Additionally, elevated blood glucose leads directly to vascular inflammation and arterial plaque.

Another angle on this topic is that studies have shown that lowering BMI, whether on a low-carb or even a calories-in-calories-out diet, usually lowers cholesterol. So independent of diet, a lower BMI is going to help improve cholesterol. A lower BMI is the goal of nearly all my patients.

Though discussed earlier, I want to again emphasize this point as it is an important one. Most of us have had it drilled into our heads since a young age that a healthy diet is a low-fat or reduced-fat diet. Conversely, we have been told by the US Department of Agriculture, the food processing industry, and medical providers that a high-fat diet is very unhealthy. But the reality is that only a minority of people, usually slender people, experience significant cholesterol elevations on a low-carb, high-fat diet. Recent studies have shown that the vast majority of patients with high BMIs do not experience any significant increase in cholesterol on a low-carb, high-fat diet.<sup>6</sup> And good cholesterol, HDL, often increases. Why? More dietary fat is being ingested and provides the building blocks for HDL. Triglycerides (fat in the blood) are also reduced with a low-carb diet for most people. Why? Because most triglycerides come from the creation of fat in the liver, the driving force of which is—you guessed it—high blood glucose. Blood glucose is the fuel for triglyceride production.

Again, these lipid profile changes described in recent medical studies are what I see in my patient population as well. Remember, thin, fit patients usually are not seeking weight loss. My patient population is self-selected to be mostly overweight patients and often in poor metabolic health. I have no hesitancy putting these patients on a low-carb, higher-fat diet, and when I recheck their cholesterol a number of months later, exceptionally rarely is there a meaningful elevation in cholesterol. Again, in most patients, cholesterol stays about the same, HDL improves, and triglycerides are reduced. Overall, they have a much more favorable lipid profile.

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6 "Acknowledgements." *Current Developments in Nutrition* 6, no. 1 (2022). Accessed May 1, 2023. <https://doi.org/10.1093/cdn/nzab149>.

So we have established that, for overweight people, a low-carb, high-fat diet is rarely a problem. However, to dig a little deeper, I do recommend that my patients try to focus on eating primarily the best kinds of fat.

### **Not All Fats Are Created Equal**

Since a low-carb diet requires higher fat intake, a good understanding of the different types of fat is important. Some types of fat are healthier than others.

The fat that humans have consumed for hundreds of thousands of years is mostly saturated fat, the fat found in meat originally obtained by hunting. Though restriction of saturated fat has been recommended since the 1970s, I do not recommend that my patients aggressively restrict it. Good sources of saturated fat include fish, meats, poultry, eggs and other dairy products like cheeses, butter, and whole milk. I suggest that skim milk and processed cheeses be avoided. Processed cheeses (think Velveeta, cheese singles, spray-can cheese) may contain soybean oil or other seed oils (bad fats), added colors, and preservatives.

Most polyunsaturated fats should be avoided. (We discuss these “bad fats” below.) Fortunately, meat usually contains only about 5 to 10 percent polyunsaturated fat. So eating meat does not increase polyunsaturated fat intake significantly. And fortunately the polyunsaturated fat in meats, especially fish and grass-fed beef, has a tendency to be more of the healthy omega-3 fats.

There are some low-carb enthusiasts who go further with a low-carb lifestyle by consuming a full meat-and-dairy-based diet. They are called carnivores or sometimes keto-carnivores. I have had only a few patients who have wanted to pursue a full carnivore direction. But when they do choose to do so, I support them. Their weight-loss progress is usually very good. If they are overweight to begin with, their lipid profiles almost never deteriorate as they pursue this all-animal diet.

In contrast to saturated fats, which I believe are generally acceptable, I have my patients avoid most polyunsaturated fats. The exceptions are the healthy omega-3 polyunsaturated fats, including the omega-3 polyunsaturated fats in meat and fish. For example, this is the type of fat in the fish-oil pills that many people take daily to lessen the risk of vascular diseases. Consumption of this type of fat is encouraged. Salmon and other

cold-water fish in particular are great sources of omega-3s. So are olives, avocados, and some nuts like walnuts. When using oil for cooking, olive oil, also high in omega-3 content, is usually the best choice.

On the other hand, seed oils like soybean oil, canola oil, and sunflower oil contain a high percentage of unhealthy polyunsaturated omega-6 fats and should be avoided. It is these oils that are usually used to manufacture processed foods (for example, packaged bakery goods, crackers, and many packaged frozen foods). They make those processed foods unhealthy. Be aware that these unhealthy oils are also used to cook most fast foods.

As we ran away from saturated fats (think red meat) fifty years ago and ate more carbs, our diet became filled with polyunsaturated oils, mostly seed oils. These refined oils—mostly soybean and corn oil—became a standard part of our diet, and this overconsumption has continued to this day. These oils, which contain the unhealthy omega-6 fats, are also known to contribute to artery wall inflammation and arterial plaque buildup.

Most of these unhealthy fats can be avoided just by avoiding processed foods containing soybean oil and corn oil. (Avoiding fried fast food will also help.) These two seed oils make up an estimated remarkable 70 percent of the oils in our current diet. We've also been led to believe that sunflower oil and canola oil are healthier oils, but this is untrue. Like soybean oil and corn oil, they are high in omega-6 fats.

Stay away from hydrogenated oils as well. These oils are created by adding a couple of hydrogen molecules to a fat molecule, usually a seed oil, to make it solid at room temperature. This hydrogenation is favored by food producers because it helps give packaged foods a longer shelf life. Margarine and Crisco are two well-known examples of this type of oil. Butter, a saturated fat, is a more nutritious option than margarine.

One class of hydrogenated oils that deserves its awful reputation are trans fats. These processed oils are dangerous contributors to vascular disease. After encouraging the consumption of trans fats as a healthy alternative to saturated fat for many years, the US government now agrees that trans fats shouldn't be consumed.

The bottom line on fat:

- Avoid all hydrogenated oils (e.g., margarine), along with foods that contain them. Avoid all trans fats.

- Stay away from soybean, corn, and other seed oils. This includes avoiding any processed foods that contain them. These polyunsaturated fats are high in the unhealthy omega-6 oils. Be aware that most fast foods are cooked in these unhealthy oils.
- Olive oil, walnut oil, and avocado oil are preferred because of their omega-3 content. Other acceptable oils that are not seed oils and are naturally solid at room temperature (not hydrogenated) are coconut oil and palm oil.
- Cook with olive oil or even butter whenever possible.
- The saturated fat found in red meat, poultry, and fish is mostly healthy. Remember, in addition to saturated fat meats also contain some healthy polyunsaturated omega-3s. If you can afford range-fed beef or poultry, these have the highest quality saturated fat and are the healthiest option. (But these meats can be expensive, and the difference in omega-3 content is not huge.)
- Cold-water fish are particularly healthy because of their high omega-3 content.
- Eggs and dairy products are healthy too. Cheeses are low in carbs and high in good saturated fats. Choose butter over margarine. Avoid processed cheeses.

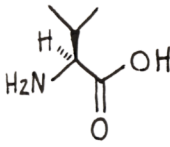
And remember that fat intake (along with increased protein ingestion—see below) is meant to replace the carbohydrates you would otherwise be eating. We humans need energy from our food, and when carb intake is lowered, it is appropriate for fat (and protein) intake to go up to provide sources of energy. Increasing fat intake to 50 or 55 percent of the diet (or higher, in the case of a keto diet) while lowering carb intake to 15 percent or lower is a key approach to losing weight and improving metabolic health. This will not only help avoid spikes in blood glucose but will also provide greater satiety.

## WHAT ABOUT PROTEIN?

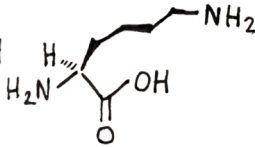
Proteins are made up of amino acids, a basic component of the body's cells. Proteins are necessary for building muscle, and they help most other organ systems maintain their physical structure as well. Some amino acids are



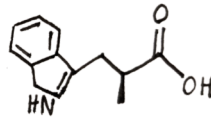
considered essential because your body cannot manufacture them by itself. The only way these can be acquired is through food. Unlike fats, proteins provide only 4 calories per gram, so they are not as energy dense.



**Valine**



**Lysine**



**Tryptophan**

*Valine, lysine and tryptophan are three of the nine essential amino acids.*

While the body can convert proteins to glucose, this usually only happens at very high levels of protein intake or during periods of starvation. It is true that very large amounts of protein can potentially raise blood sugar (and even have an impact on insulin levels). However, in the amounts humans usually consume, protein's impact on blood glucose and insulin is very limited in comparison to carbohydrates.

Protein intake has been shown to decrease hunger and assist with weight loss. Several studies have shown that an increase in protein consumption (say, from 20 percent to 30 percent of calories ingested) actually improves the ability to lose weight. This can be true even if the overall number of calories eaten remains the same. My personal experience with my patients is that sometimes when a patient's weight-loss plateaus, increasing protein intake and lowering fat intake slightly can help them get "unstuck" so weight loss can resume.

Be aware that people with compromised kidney function must be conscious of how much protein they're eating. Too much of it can worsen kidney disease. We have discussed that long-term diabetics frequently have kidney function issues because of vascular disease. I always evaluate my patients' kidney function before pushing up their protein consumption. For example, a patient with moderately reduced kidney function may need to have their daily protein target reduced 30 percent or so (say, from 125 grams to about 90 grams). If the kidney function tests I do on a patient (BUN and

creatinine) are abnormal, I will often consult a nephrologist regarding the appropriate maximal protein load for that patient.

### **How Much Protein Is the Right Amount?**

As a general rule, most people do not consume enough protein. This is true of nearly all of my patients until we target a given amount of protein intake. The amount of protein ingested should generally conform to the desired level of muscle mass sought. And of course, most people will benefit from a larger muscle mass. Very simply, if you want to build or even just maintain muscle, you need to eat adequate protein. On the extreme end, bodybuilders must ingest very high levels of protein while lifting heavy for the purpose of adding a large amount of muscle mass.

But even for people not trying to build excessive muscle, protein intake is important. This is especially true for older people so that they can maintain enough muscle strength for activities as simple as getting up and walking around. One significant reason for immobility in the elderly is a lack of muscle mass. I've seen this repeatedly over my many years in the emergency department. I see frequent falls in the elderly because of a lack of leg strength. Large numbers of nursing home patients are in these facilities due to an inability to just get out of a chair and walk. This frequently occurs not because of some neurological issue or leg injury but a straightforward lack of muscle mass resulting from a combined lack of protein intake and daily muscle use (even exercise as simple as frequent walking).

Growing one's muscles mass helps diminish insulin resistance. The muscles attached to our bones, called skeletal muscle, absorb 70 percent of all the insulin the pancreas makes. Therefore, an increase in muscle mass helps soak up excess insulin and allows the skeletal muscles to take in more blood glucose.

As with fat, protein intake increases satiety, that feeling of fullness. Though the effect of protein on decreasing hunger is not as great as with fat, protein helps with reducing appetite. Hunger can even continue in the face of increased fat consumption if protein intake is too low.

In general, protein should make up a minimum of 20 percent or more of calories ingested. I push this to about 35 percent in some of my patients. A basic guideline is that protein should be eaten in the amount of about 0.5 to 1 gram per pound of desired body weight. Protein intake for those pursuing

a low-carb diet can be pushed to the higher end of this range. This includes people doing three or four substantial strength-training workouts per week.

For those with insulin resistance, weight training (weightlifting, squats, chin-ups, push-ups, etc.) is very helpful in achieving weight loss, especially the loss of visceral fat. (We will spend all of Chapter 8 on this subject.) A significant reason for this is that more muscle helps lower insulin resistance. Strength-training efforts also result in improved body composition: that is, a decrease in body fat percentage and an increase in lean muscle mass. With their workout efforts, even as they add muscle, my patients' waist circumferences improve.

Protein is contained mostly in eggs, milk, cheese, meat, and fish. To a lesser degree, it exists in plant-based foods like nuts, legumes, quinoa, and wild rice. But be careful—a lot of these plant-based foods also have a lot of carbs, so be mindful of how much of them you eat if you are using plants as a source of protein.

### **A Few Words about Protein Shakes**

No discussion of protein is complete without a comment on protein shakes. These shakes can be a very viable source of protein for most people. As low-carb dieters using CGMs seek to decrease the number of carbs consumed to lower blood glucose, using protein shakes with a very limited number of carbs in them as meal replacements is appropriate.

Protein shakes make consuming large amounts of protein easy. It makes this process so easy that sometimes my patients need to be careful not to overdo it. In general, protein should make up no more than 35 percent of your diet. Again, the guidelines are about 1 gram per pound of ideal body weight.

Protein drinks, whether purchased as a powder or as a liquid shake, may be composed of various protein sources. Whey protein, the most common type of protein used in shakes, is derived from milk. So is casein protein. Shakes made of egg white protein are also available. Any of these sources of protein are fine. It does not matter if you purchase a powder or a premixed liquid; this is simply a matter of cost, taste, and convenience.

Plant-based protein powders and shakes are usually composed of bean or seed protein. It is important to note that most plant-based protein powders and shakes do not have the essential amino acid content of dairy-

derived protein shakes. Remember, “essential” amino acids are those that your body cannot manufacture independently. Because essential amino acids may be missing in plant-based protein shakes, I suggest to my patients the use of a dairy-based protein powder if possible.

Another thing to consider with protein shakes is the carbohydrate content. Some protein shakes and powders are designed to taste good, but for some shakes, this may only be achieved with significant amounts of added sugar. So be wary of the number of carbohydrates the shake contains, as most of the carbs in these drinks are, in fact, sugars. Also, if you mix your shake with milk, milk will add approximately 12 additional grams of carbs in an eight-ounce serving. Many of my patients use water or unsweetened low-carb milk like almond milk or soy milk to make their shakes. Overall, I suggest my patients limit a twelve-ounce protein shake to no more than 10 grams of carbs, preferably 6 or 7 grams. To make the shake taste fuller, even creamier, you can add a good oil (coconut or palm) or eggs. The latter further adds to the protein content.

Fitness professionals suggest drinking protein shakes fifteen to sixty minutes after exercise. This is called the “anabolic window,” and it is a period of time when the muscles may more readily absorb amino acids. This is a reasonable suggestion to follow. However, overall, I am more concerned that my patients are taking in an adequate amount of protein and using shakes to supplement that effort than when they drink their shakes. Many of my patients use a shake as the first meal in the morning, often around 10:00 or 11:00 a.m. as they break their fast. Morning protein is a great “whey” to start the day!

To summarize:

- Protein is needed for maintaining muscle and reducing the sensation of hunger.
- Protein ingestion, when associated with resistance training, increases muscle mass. This larger muscle mass absorbs more insulin and glucose, lowering insulin resistance.
- Daily protein intake should be about 20 to 35 percent of total food intake. The higher end of this range is for individuals who want to build muscle through resistance training.

- Protein is contained in dairy products, meat, fish, and poultry. Plant-based foods like nuts and beans have protein as well, though in lesser amounts. Some grains contain protein, examples being rice and quinoa, but if using grains to meet protein goals, be careful of the amount of carbohydrate in these foods.
- Protein shakes are a viable way to consume more protein. Avoid shakes with added sugar. When you drink the shake may matter, with consumption during the anabolic window possibly the best time. I also think protein is a great option for your first meal of the day. Good fats and eggs are appropriate additives to your shakes.

## WHAT ABOUT CARBOHYDRATES?

Now that we understand fats and proteins, let's discuss the main event in more detail. This is the driver of most of our weight-gain issues: carbohydrates.

As we've discussed, the typical American diet contains about 300 grams of carbohydrates per day. Obese individuals often consume even higher amounts. Some people's diets may be 70 percent or more carbs. As we as a country have reduced our fat consumption in the last fifty years, we have more than made up for it in terms of calorie intake from carbs. Thank the food pyramid for this. The food pyramid's emphasis on carbs ushered in our epidemics of diabetes and obesity.

Can you guess the number of carbohydrates necessary for a human to survive? The answer is zero. You read that correctly—you do not need to eat any carbohydrates to survive. The body can produce all the energy it needs from fat and protein. We require essential fats and essential proteins, but there is no such thing as an essential carbohydrate.

That said, other essential nutrients are contained in carbohydrate-rich foods. Vitamin C from fruit is one example among many. Those nutrients can be obtained in other ways if no carbs are consumed. If a person chose to eat absolutely 100 percent fat and protein with no carbs at all (unlikely, though on a keto or carnivore diet, you can get close to that) and they ingested the needed vitamins and minerals as supplements, that person would function just fine. They could be the picture of health with no carbs in their diet at all.

As you already know, carbohydrate intake affects blood glucose more than any other macronutrient. This means that anyone looking to control their blood sugar has to watch their carbs first and foremost. As discussed, protein and fat have a very limited impact on blood glucose. Thus, unless strict, aggressive calorie restriction is the goal, I believe that losing weight relies largely on reducing the number of carbs eaten.

Carbohydrates contain 4 calories per gram, so they are not particularly energy dense. People sometimes have the mistaken belief that ingesting complex carbohydrates like potatoes and rice can prevent weight gain because sugar is being avoided. However, most complex carbohydrates are converted to glucose by the digestive process, raising blood sugar. So eating a significant amount of complex carbs can be almost as detrimental to weight-loss goals as eating lots of simple sugars.

### **The Types of Carbohydrates**

Let's review the types of carbohydrates that make up our diet and the impact they have on our blood sugar. And while we have focused on complex carbs (starches) and simple sugars, there is a third type of carbohydrate: fiber.

#### ***Fast Fiber Facts***

Fiber is the one type of carbohydrate not digested by the body. Instead, it passes through the bowels and is excreted in the stool. In and of itself, fiber has no nutritional value, but it is important for digestive health. The intestines push the contents of our bowels through our system, and fiber helps the mechanics of pushing the bowel contents along. This not only avoids constipation and diarrhea but also ensures that the body has the time to absorb the nutrients and macronutrients it needs from the non-fiber stool content: that is, the other food components in the bowels.

In general, Americans do not eat enough fiber. Dietary authorities and nutritionists recommend 25 to 30 grams per day, but most Americans consume only half this amount. This is despite the fact that we have been encouraged for years by nutritionists and the government to “eat more fiber.” (This is a governmental nutritional recommendation I actually agree with!) A lack of dietary fiber is believed to be a major cause of muscle weakness and inflammation in the large bowel. (Yes, muscle fibers surround the bowels to push food along—a process called peristalsis.) Poor fiber consumption likely contributes to a type of bowel infection called diverticulitis.

Fiber is found in beans, nuts, and grains, as well as most fruits and vegetables. Unrefined grains and whole grains have more fiber than refined grains. Most of the fiber has been removed from refined foods such as white bread, white rice, non-whole grain crackers, and pastries.

Remember the phrase “fiber is free” when pursuing a low-carb diet. Because fiber is not absorbed by the intestines, it does not add to blood-glucose load. Also, many foods containing a large amount of fiber (except fruits engineered to have a high sugar content) raise blood sugar slowly and not to the extent of carbs without fiber. For foods like this, the fiber slows the absorption of other carbohydrates. Foods with increased fiber and complex carbs have a lower glycemic index than similar foods with little fiber. These low-glycemic foods raise blood glucose more slowly than high-glycemic foods. (Much more about low- and high-glycemic load foods later.)

When I have my patients count carbs, I am interested in “net carbs.” This means that when you look at a food label, you can subtract the amount of fiber from the number of total carbohydrates. For example, if a food has 59 grams of carbohydrates in total, but 6 of those grams are fiber, the actual amount of net carbs you’ll ingest is 53 grams. The 6 grams of fiber will go in the toilet. Again, fiber is free. Net carbs are what matter.

Since fiber is good for digestive health and does not raise blood sugar, at least 25 to 30 grams of fiber daily is a very good idea. Some of my patients ingest much more than this. Many keto foods available at the grocery store purposely substitute increased amounts of fiber for complex carbs. An example is keto bread. Even patients who are not pursuing a keto diet often consume these keto-type products. This approach helps them lower their carb intake for the day and meet their carb-limit goals.

### ***Simple Sugars Simply Kill***

Sugar is *the* simple carbohydrate. It may not kill immediately, but long term, it is responsible for an awful lot of disease and, indirectly, death. The path to these bad outcomes, as we’ve discussed, is vascular disease. Simple carbohydrates spike blood-glucose and insulin levels, prevent the burning of fat, and promote weight gain. They also cause vascular inflammation. Thus, the recommendation is an easy one: avoid sugar as much as possible.

The three most commonly eaten basic sugars are sucrose, fructose, and glucose. All sugars contain 4 calories per gram. Sucrose (a combination

of fructose and glucose) is the scientific name for table sugar. You should probably be familiar with fructose from the term high-fructose corn syrup (HFCS). HFCS is one of the primary sweeteners used in the manufacturing of most processed foods. It is the primary sweetener in sodas. Fructose is also the primary sugar found in fruit.

Glucose is found in honey, dried fruits, and in smaller amounts in some vegetables. So you can see that it is not the major sugar consumed in our diet. Those would be sucrose and fructose. Both sucrose and fructose are broken down in the gut to glucose and then absorbed into the blood as glucose. So when you see just about any sugar in a food product, in general, it is safe to think, “In a few minutes, that will be glucose in my blood.” This is a bit of an oversimplification, but a helpful general rule. So glucose is not the most ingested sugar, but most ingested sugars become blood glucose upon absorption in the bowel. To reiterate, most sugar ingested is either sucrose (which, remember, has glucose as part of its structure) or fructose. But once absorbed by the gut, blood glucose is the issue. A small amount of fructose is also directly absorbed into the blood. (See below.)

Sucrose is a disaccharide, which means that two sugar molecules—in this case, fructose and glucose—make it up. Sucrose is found in many fruits (along with fructose) and in vegetables, and some grains. Like fructose, it is also added to many processed foods such as sweetened beverages, cereals, canned foods, candy, pastries, cookies, and ice cream. Sucrose and HFCS are the common sweeteners in nearly all processed foods.

Fructose is also found in fruit, root vegetables, and some other vegetables. Again, fructose, whether as one of the two sugars in sucrose or as an independent molecule in our food, is mostly broken down in the intestinal wall to glucose. As mentioned, a limited amount of fructose is absorbed directly into the blood. It, of course, exists in much lower concentrations in the blood than glucose. Most of the fructose absorbed directly into the bloodstream goes straight to the liver and is converted to glycogen and fat.

As we’ve talked about, much of the glucose derived from fructose and sucrose during intestinal absorption, if not used as an energy source by the body immediately, will eventually form glycogen. Some glycogen will then ultimately be converted to fat in the liver. So both fructose and glucose can contribute to fatty liver disease and the deposition of increased visceral



fat. Remember the bear fattening up in the fall getting ready for winter hibernation. Mostly, it's blood glucose and a little fructose in the blood that makes that happen.

Glucose is the preferred energy source for your body tissue, and this is what the CGM measures. The total amount of sugar and complex carbohydrates ingested is reflected in blood glucose. The CGM sensor transposes that concentration of blood sugar into the numbers, patterns, and trends you see on your CGM.

Artificial sweeteners (aspartame, saccharine, xylitol, sucralose, erythritol) in limited quantities are a reasonable alternative to the ingestion sugars. They are preferable to eating sugars but are not without their own issues. In my opinion, moderate use of artificial sweeteners is much preferable to sugar ingestion. This is mostly because simple sugars raise blood glucose and make it impossible to burn fat during the time blood sugar is elevated. This being said, there is some evidence that artificial sweeteners may impede weight loss if ingested in large amounts. So the use of diet sodas and other foods sweetened with artificial sweeteners is reasonable, but the ingestion of these alternative sweeteners should be only moderate. Many of my patients can avoid seeking a sugar fix by eating an artificially sweetened food. This is much preferable to blowing your carb allocation for the day. But a half a dozen diet sodas a day is not a great idea. Consume artificial sweeteners in moderation.

Simple sugars do not satisfy hunger the way fats and proteins do. When we eat sugar, for the most part, we remain hungry. Sugars provide hardly any hunger reduction unless large amounts are consumed. Food manufacturers and the food scientists who work for them count on this to increase sales. Satiety is usually only achieved after eating an awful lot of sugar, and it has a tendency to be short lived. Blood glucose goes up, then insulin is released, often overshooting the mark, and blood glucose falls. When it drops, we are hungry again. We'll be seeking our next meal or snack (often another sugary option) within the next few hours.

If a sugar fix is needed, dark chocolate (with 82 percent or more dark cocoa) is often the best option. Some berry fruits like blueberries and strawberries are good options as well, as their overall carb content is relatively low compared to most other fruits.

In modern times, many fruits have been genetically modified to taste good. This is done by altering the fruit to have a high fructose content. Fifty years ago, fruits in the grocery store contained much less sugar. I believe the common concept of fruits always being healthy is no longer as true as it once was because, in general, the amount of sugar in fruits is so much higher now than it was in the past. The value of consuming a large amount of fruit packed with fructose as part of a healthy diet for a person with insulin resistance should certainly be questioned. Some genetically modified fruits can spike blood glucose almost as high as a candy bar. The recommendation here is not to avoid fruits altogether but to consider their sugar content. When mom told you to eat all your fruits and vegetables when you were growing up, fruits contained less sugar. So that adage can no longer be universally applied. Things have changed. In general, I have my patients limit the fruit in their diet, as guided by their carb limits and their CGMs, and when they want fruit, opt for berries.

As we discussed, the small intestines absorb sugar ingested and then release it into the bloodstream as glucose. The pancreas detects this increased glucose and releases insulin, which signals the body's organ systems to absorb it. This glucose is then used as a source of energy. Once glucose is absorbed from the blood by the organs, the level of blood glucose trends lower. It is critical that insulin and glucose be in balance; when this balance is upset by insulin resistance, blood sugar rises more quickly and stays elevated for longer periods of time.

In summary, from a dietary standpoint, stay away from sugars as much as possible. Consumers are often unaware of how much sugar many food items contain. Breakfast cereals are a perfect example. Read the food labels; sugar content is always listed. CGM readings can be vital in helping you understand the impact of foods containing sugar—even fruits—on your blood glucose.

### *Complex Carbohydrates*

If it is a carbohydrate and it isn't a sugar or fiber, it's a complex carbohydrate. Unlike simple sugars like glucose and sucrose, complex carbohydrates are sugar molecules linked together in massive chains that are bundled together. Our digestive system breaks these chains down into simple sugars, which are then absorbed into the body as glucose (with limited amounts

of fructose). This glucose then, of course, is reflected in CGM numbers. Because complex carbs are often broken down to glucose over hours, the blood-sugar elevations associated with complex carb ingestion can last a long time. (The length of elevation is often dependent on whether the food contains a significant amount of fiber as well—see the discussion on the concept of glycemic index below.) Because most people eat complex carbs in higher quantities than sugars, complex carbs are a huge source of energy in most diets. The result of their ingestion can be significant glucose elevations, with eventual conversion of that excess glucose to visceral fat. The result is weight gain.

Complex carbohydrates are contained in grains (think of the flour used to make bread), rice, potatoes, most vegetables, fruits, roots, and some nuts. (Fruits contain not only fructose and fiber but also complex carbs.) Grains are our largest source of carb intake, and this intake has only increased with our turning away from fat in the latter half of the twentieth century as we were directed to avoid fat and eat more “heart-healthy” carbohydrates.

It’s only been about 12,000 years since humans progressed from a hunter-gatherer society to an agrarian one in which grains were eaten in large quantities. This means that for most of the 200,000 years of human history, large amounts of carbohydrates were absent from the typical diet. Our distant ancestors were largely carnivores, except for some nuts and roots. Refined wheat flour has only been a large part of the typical diet for the last several hundred years. And in the last fifty years, our refined grain consumption has grown dramatically.

Refined grains are grains that have had much of the fiber removed during processing. These grains have had the bran and germ separated. Refined grains have a finer texture and can be stored for long periods of time. Longer shelf life is a major reason food manufacturers utilized refined grains. Processing takes out nearly all the fiber as well as some nutrients. White rice, corn meal (grits), most white breads, pastas, pastries, cakes, crackers, and pretzels all fall into the category of being composed of refined grains.

Like simple sugars, complex carbs do not satisfy hunger well. Think about it—you rarely stop at a handful of chips or pretzels; you want more. You may even down a whole box of crackers, then head back to the kitchen

looking for more food because you're still hungry. Snack foods (popcorn, pretzels, etc.) as well other complex carbs that are not usually thought of as snack foods (for example, bread) are often eaten in large quantities without even thinking about it. Whole-grain crackers may have a bit more fiber, but they contain plenty of non-fiber complex carbs too. They are not as healthy for us as the manufacturers suggest. Even whole-grain crackers don't erase hunger well. The same goes for a vast majority of other baked goods partially or wholly made up of refined grains like bread, cakes, cookies, and pastries.

And who doesn't love pasta? Remember, pastas are more or less just refined wheat flour mixed with a little water and eggs.

As mentioned above, many fruits are packed not only with sugar but also with complex carbohydrates. Pears, apples, and bananas are great examples. That's not to say that all fruits are bad, but it is important to be aware that they come with a lot of carbs, both simple (sugars) and complex. Regarding fruits, blueberries and strawberries are your best bet, as they have fewer overall carbs (simple and complex) and a fair amount of fiber.

Vegetables like green beans, tomatoes, peas, onions, and carrots are also relatively high in carbs. However, there are low-carb vegetables. These include lettuce, spinach, broccoli, cauliflower, zucchini, asparagus, mushrooms, avocados, bell peppers, kale, and Brussel sprouts. Though this latter low-carb vegetable group contains some complex carbs, their inclusion as part of a low-carb diet is very acceptable. These preferred vegetables also have a tendency to be higher in fiber. From a portion standpoint, it is hard to overdo, for example, cauliflower or asparagus.

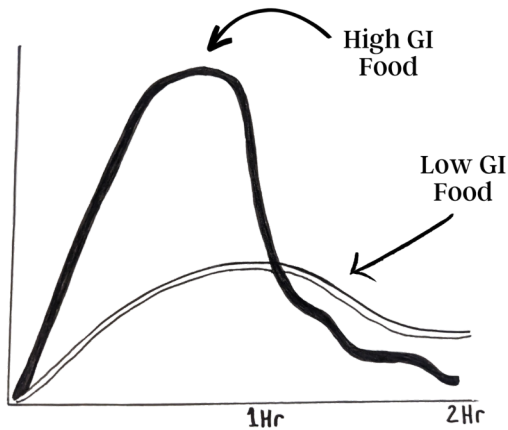
I understand that some of my statements related to fruits and vegetables in particular may be viewed with some skepticism. Again, we've been told from a young age to eat plenty of fruits and vegetables. But in reality, for most Americans, the high carb load of some fruits and vegetables (when complemented with all the grain, rice, and potatoes we eat) provides a level of carbohydrate intake that results in weight gain. Obesity isn't caused by high caloric intake on its own. In the US, it is caused mostly by high carb intake. For most people who are overweight, fat doesn't make you fat. Carbs do. It is the carbs we eat that are very much responsible for the high body mass index of most US adults.

In addition to the total amount of complex carbs in our food, we also have to look at how fast the body digests those complex carbs. This rate of digestion affects how fast blood glucose rises and how long that level stays elevated. Complex carbs raise blood glucose for a longer period of time than sugars. However, different complex carbs raise blood sugar to different levels for varying lengths of time. This relative amount of blood-glucose change is known as the glycemic index, or GI, of a food. Let's explore GI further.

## THE GLYCEMIC INDEX AND YOU

The GI is a ranking of foods according to their impact on blood-glucose levels. Carbs with a low glycemic index raise blood sugar more slowly than foods with a high glycemic index. High-glycemic foods are digested more rapidly and have a tendency to spike blood glucose a little higher, but then that blood glucose comes back down in a shorter period of time. Low-glycemic foods digest more slowly, so the blood glucose rises to a moderate level, but this level stays high for a longer period of time. As an aside, low-glycemic foods generally also lower the amount of insulin the pancreas sends out. Because low-glycemic foods spike blood glucose less aggressively, insulin response is not as great. For people on a low-carb diet, they are preferable to high-glycemic foods. The categorization of food as low GI or high GI often relates to the amount of fiber in that food. Increased fiber slows digestion of the sugar and complex carbs in that food. Higher-fiber foods have a lower GI, and foods with less fiber have a tendency to have higher GI numbers. The GI ranking ranges from 0 to 100.

For example, canned or frozen sweet corn has a glycemic index of about 85, while broccoli's is only 15. This means the corn will spike your blood sugar higher, and usually, the elevation will be relatively more brief. The broccoli will cause a lower elevation of blood sugar, though the blood sugar may remain elevated for a longer time.



*Example of comparative impact on blood glucose levels of high and low glycemic index foods.*

Tables of the glycemic index of different foods are readily available with a simple internet search. Additionally, in Chapter 6, in our discussion of different low-carb diet options, a list of common foods and their glycemic index number is provided.

Eating low-GI foods is helpful for anyone focused on controlling blood glucose. A lower glycemic index will help keep blood glucose at a lower, more stable range. I generally do not have my patients focus on GI only, but I make sure they are all aware of this concept. I put a much bigger emphasis on having them count net carbs. Lower-GI foods also have a tendency to be lower in net carbs because they have more fiber. So as part of a low-carb diet, lower-GI foods should usually be a comparatively more significant component in comparison to high GI foods. But again, I don't recommend using only GI as a guide to diet. However, if GI was exclusively used to guide diet (without counting carbs at all), carb intake would nevertheless be reduced. In my experience managing carb intake only using GI as a guide does not allow carb intake to be reduced adequately to achieve meaningful weight loss. Calorie restriction would be needed as well. And, as we have discussed, for nearly everyone, long-term calorie restriction does not work.

## SUMMARY POINTS ON CARBOHYDRATES

Sugars are simple carbohydrates, but they aren't the only carbs that raise blood glucose; complex carbs do as well. Complex carbs, like sugars, prevent the burning of fat by keeping blood glucose high for long periods, causing insulin to be released and increasing the likelihood of eventual insulin resistance. Low-glycemic carbs help avoid blood-glucose spikes. But a diet of low-glycemic foods alone without caloric restriction, in my experience, will not allow for adequate weight loss. A better approach is restricting overall carbs and incorporating low-GI foods into that dietary consideration.

I recommend a daily carb limit target to all my CGM patients. In this context, sugars are largely avoided, and when complex carbs are ingested, lower-carb fruits and vegetables are much preferred. Lower-glycemic fruits and vegetables are usually included on the list of acceptable foods as they are generally lower in total carbs and contain more fiber. (And fiber is free.) And now that you know how the macronutrients affect your blood-glucose metabolism, let us move on to how you can structure your diet—the exact same way I teach my patients one on one.





## CHAPTER 6



# CONTROLLING BLOOD GLUCOSE TO LOSE WEIGHT: THE DIET OPTIONS

In the previous chapter, you learned the “why” and “what” of low-carb dieting with a CGM. This chapter will teach you the all-important “how.”

In recent years, the one-size-fits-all approach to medicine has been challenged by the growing focus on personalized health care. Examples include selecting a cancer treatment based on biomarkers found in a tumor biopsy or choosing medication based on genetic studies. CGM dieting is also personalized medicine. Dietary changes for weight loss and overall health improvement are based on data specific to the person wearing the monitor.

A CGM gives the user constant, real-time feedback regarding dietary impact on blood glucose. It effectively guides dietary choices. Specifically, this tool can guide the type, timing, and number of carbs ingested. Nearly by default, with a little increased focus on getting adequate protein, it can also guide the amount of protein and fat ingested as well.

As a result, a CGM-based diet is not a one size fits all diet. It is based on an individual’s personal blood-glucose numbers and patterns. Over time, my patients learn which foods affect their blood glucose the most,

which to avoid or minimize, and which are fine to eat. And there's often more variability from person to person than you would intuitively expect. This being said, though no two people's CGM patterns are the same, there are some common themes to guiding your diet by CGM numbers. The overriding theme is that for all patients, the key is controlling blood glucose so the body turns to fat as an energy source. In my practice, a CGM-based diet is always a low-carb diet.

It is beyond the scope of this book to describe every low-carb diet in detail or provide specific meal plans or recipes. There is plenty of information on these topics out there on the internet. Instead, I will review the general concepts of low-carb dieting and describe diets that are compatible with a low-carb lifestyle.

As we've discussed, to lose weight, blood glucose must be kept in check so the organs turn to fatty acids for energy. For healthy people, this includes maintenance of blood glucose in the normal or even low-normal ranges. This often is a daily average (average blood glucose over 24 hours), no higher than 100, preferably lower. Some achieve averages routinely in the 80s. But for patients with insulin resistance, the number may be much higher. Getting to lower numbers will take time and effort for people who already have insulin resistance (for example, prediabetics and those on the verge of prediabetes). For some, these types of numbers may never be obtainable. The important point is that all patients work to reach lower numbers. With progressively lower numbers, weight will be lost, and health will be improved.

So, all my patients start from a different place. The important thing is to see where your numbers are and then set personal goals to work toward. Weight can be lost and metabolic health improved with any meaningful movement toward better numbers. It is a process, and each patient's journey is different. And often, even just a relative change in range without even reaching an absolute low fixed number can make a big difference. Again, this is personalized medicine, and CGM allows for a personalized approach. This includes the setting of goals and the monitoring of progress. As I tell my patients frequently, "I'm looking for progress, not perfection." We set reasonable goals, they reach them, we celebrate their success, and then we set a higher standard.

But to give you another number to hang your hat on, many of my nondiabetic patients often keep post-meal blood glucose in the range of 130 or less. Patients with prediabetes, diabetes, or even just insulin resistance have higher post meal numbers. However, even starting at higher levels, with a CGM to guide diet, these targets and ranges always improve over time.

So even with my diabetic and prediabetic patients who have much higher numbers, as they get their insulin resistance more under control, they also lose weight. So the specific numbers are all relative, depending on where a patient starts. But for all these different categories of patients, once they get their numbers to a lower range through diet (not counting the effect of blood glucose-lowering medications), they will have success. Whether nondiabetic, prediabetic, or diabetic, avoidance of blood-glucose spikes, blood-glucose variability (spikes and then drops) and prolonged elevations (to the extent possible) is very important.

A core concept of a CGM-guided diet is that if your goal is to consume fewer carbs, you needn't go hungry. I tell all my patients, "You never have to be hungry; you can always eat something." This is in contrast to a calorie-restriction diet. It is true that, depending on their carb target for the day, what they eat at a given moment may need to have few to no carbs. But they can eat. As we review different diets, this is a key concept to keep in mind.

In general, starting with a daily carbohydrate goal of "50-ish" grams per day is the best approach. As I mentioned before, I often suggest an initial target of 35 to 50 grams for my patients. I have found this to be a good target, even for patients who come to me eating 300 or more grams per day. My experience is that starting higher—say, at 125 or 150 grams—and incrementally lowering that target can be somewhat painful. It's best to rip the Band-Aid off fast and go straight to a relatively low goal rather than adjust this target to a lower level gradually over a period of months. Almost all my patients do very well with this approach. And many see weight-loss results early on, which reinforces their commitment to and belief in the process.

The physiological adjustment for the body to eating fewer carbs is usually minor. Remember, a human does not need carbs to survive.

For my patients, the adjustment is more mental. And again, nearly all do quite well in this transition. From a mental standpoint, it takes a while to stop desiring certain foods. However, this becomes progressively easier as the weeks pass, especially when patients are seeing results on the scale.

Of course, knowing how many carbs you're eating requires . . .

## **COUNTING CARBS (BUT NOT CALORIES)**

I ask my patients to be meticulous about counting the carbohydrate grams they eat each day. Diabetics on insulin who are knowledgeable of the impact of carbs on their blood glucose and who are diligent in their blood-glucose management routinely do this, often in conjunction with checking their blood glucose (even by finger stick) many times a day. They need to know the amount of carbs they are eating so they know the amount of insulin to inject. So carb counting is a common practice for diabetics on insulin. It has also been a common practice for anyone pursuing a low-carb diet since this type of diet was first popularized by Dr. Robert C. Atkins (of Atkins Diet fame) nearly fifty years ago.

You'll find many online information sources to help you count carbs accurately. A phone app is almost universally helpful as well. Carb Manager, My Fitness Pal, and Cronometer are common smartphone apps my patients use to count carbs. Many of these apps provide carb counts for thousands of food brands in the grocery store. Often, getting the carb count is as simple as scanning a label. Restaurant meals can be found in most apps as well. As you gain more experience using these apps, you'll find it becomes relatively easy to track how many carbs you're eating.

To count carbohydrates effectively, you need two pieces of information: the carbohydrate concentration (standard carbs per amount: for example, carb grams per standard volume or weight) and your specific portion size. You can find the carbs per standard portion size on the food labels or in the apps mentioned above. And you can assess your portion size by consuming a standard portion size (as listed on a food label) or by using a measuring cup or scale to assess your food amount. In my practice, I provide my patients with a food scale and instruct them to use it as much as possible. Sometimes volumes need to be measured, and a standard measuring cup can be helpful.

If eating a standard packaged food portion, the information is already listed on the label.

It's not just candy, bread, and pasta that contain carbs. Count everything from the cream in your coffee, the ketchup on a fast-food hamburger (no bun), your glass of wine with dinner, and even that after-dinner mint. Don't underestimate your portion sizes. I found that the more rigorously my patients count their carbs, the better they do in terms of weight loss. Thinking you are getting 40 grams per day when you're really getting 75 grams per day is a big problem and greatly slows your weight-loss progress. This scenario of inaccurate carb counts can be a huge impediment to progress. And I have seen it more than once. A patient may think they are at a targeted level and should be losing weight. But if they are not at that level because they are ingesting 20 or 30 more grams per day than they think they are, frustration can ensue. Accurate carb counts are essential. Eventually, your knowledge base on carb counting will build, and this counting will require less effort. But initially, it is important to be very exact about your carb ingestion.

Another way to get a good understanding of carb content is to start by reducing the food variety in your diet. It just makes the counting easier, and this reduced variability does not need to be permanent. With fewer items to count, you can relatively quickly learn the amount of carbs in the food you eat. For example, you could initially limit vegetable choices to lettuce, broccoli, and cauliflower. Restrict fruits to strawberries and blueberries. If you have the strong urge for a small bite of candy, make your routine a bite of dark chocolate of 82 percent cocoa or greater. You can maintain standard portion sizes for meat, eggs, and cheeses. This will make your counting much easier early on. Once you figure out how to easily count carbs, you can increase food variety significantly. However, at the beginning of building their knowledge base on the carb content of different foods, my patients often find that repeating meals and limiting food varieties simplifies their life.

Cutting back on snacking makes this process even easier. Many of my patients also do some intermittent fasting, eating only two meals a day.

This obviously helps reduce the complexity of keeping accurate carb counts. More on fasting in a later chapter.

## Setting (Realistic) Goals

If you're a new patient of mine, we begin by doing a clinical and laboratory assessment of your metabolic-health status. I then place a CGM painlessly on your arm and ask you to do the following over the next two weeks:

1. Eat your typical diet so I can get a true assessment of your glucose levels and patterns at your baseline.
2. Try to estimate your daily carb intake for just one or two days. I want to get a general handle on whether you are eating 150 or 350 carbs per day. This estimate does not need to be as rigorous as when we implement a carb target later on; it can just be a general estimate.

I do find that a significant number of patients feel they are already eating low carb but are really at 150 or 175 grams per day. These higher-than-expected numbers allow for an opportunity to improve those counts and then achieve good progress once we get more rigorous about the counting.

With this information, we can set weight-loss, metabolic-health, and grams-per-day intake goals. After the first month or so, we'll focus on fasting patterns and strength training.

So in that first treatment month, we set a grams-per-day carb goal, based on the following understandings:

- Weight-loss success is related to the amount of carbohydrate ingestion (grams per day).
- An initial level of 50 carbs may cause initial (but usually transient) fatigue.
- There is some level of discipline required for a given level of carb limitation. But remember, you can always eat something.
- Previous dietary food preferences are considered. We talk this over. For example, patients who insist on fruit intake may need a little looser carb goal to start. It goes with the territory that weight loss may not occur as rapidly as if fruits were not regularly ingested. But if they feel it is important, we work through it.
- Your current level of workout activity.
- Your social situation. For example, do you live alone and control what is in the fridge, or are there a spouse and/or children in the home whose eating habits may influence your eating behavior? If

it's the latter, we need to address how that will be managed.

The goal I set for most patients in the first month is, again, 35 to 50 grams of carbs per day. Some patients insist on a goal a little higher (usually just because of apprehension about doing something they have not attempted previously) and some a goal a little lower (keto range: usually only for patients who have done a keto diet previously). The aim is to pick an initial goal with which the patient can achieve success.

### **Which Foods Are “OK”?**

It is very simplistic, but even though they are checking labels and weighing food, I have my patients mentally break foods down into three categories based on carbohydrate content. This helps patients orient themselves to what foods they should even be considering:

- OK: can often be consumed in relatively high quantities
- Less OK: can be consumed sometimes, but you must be careful
- Not OK: should never be consumed

Each group can be further broken down by general category of food: e.g., protein, dairy, nuts, et cetera. (See below.) While these lists aren't exhaustive, they contain many common foods that can form the foundation of a low-carb diet. Avoidance of processed foods goes a long way toward controlling carbs. If a processed food is consumed, the contents (as listed in the categories below) need to be considered individually.

#### ***OK Foods:***

- Protein: fish, shellfish, poultry, bacon, pork, beef, bison, lamb, eggs
- Dairy: butter, cream, cheese (all of these should be full fat)
- Vegetables: leafy greens (lettuce, cabbage, spinach, kale, chard), asparagus, cauliflower, celery, mushrooms, cucumbers, radishes, zucchini, avocado
- Grains and seeds: chia seeds, flax seeds
- Nuts: walnuts, pecans, pine nuts, macadamia nuts, hazelnuts
- Oils: avocado oil, olive oil, palm oil, coconut oil
- Condiments: full-fat mayonnaise, mustard
- Liquids: coffee (black or with only full-fat cream), tea, other drinks that contain no calories

***Less-OK Foods:***

- Protein: deli meats (check label for carbs), tofu, legumes
- Dairy: yogurt (unsweetened, full-fat only)
- Vegetables: tomatoes, carrots, onions, eggplant, broccoli, brussels sprouts, spaghetti squash, yellow squash, artichokes
- Fruits: blueberries, strawberries, raspberries, blackberries, kiwi, lime juice, lemon juice
- Nuts: peanuts, pistachios, almonds, almond flour
- Grains and seeds: sunflower seeds, pumpkin seeds, sesame seeds,
- Liquids: almond or soy milk (unsweetened, limited quantities)
- Alcohol: unflavored spirits, low-carb beer, dry wine (all in limited amounts)
- Sweets: dark chocolate (82 percent or higher cocoa), artificial or natural low-carb sweeteners (no or very low carb)

***Not-OK Foods:***

- Vegetables: chickpeas, potatoes (any type), winter squash (butternut, acorn, pumpkin), corn, leeks, beets
- Fruits: dried fruit, cantaloupe, watermelon, peaches, apples, plums, cranberries, pears, grapes, bananas, pineapple, apricots, mango, cherries, papaya
- Nuts: cashews
- Grains and seeds: wheat or refined flour, pasta, oats, corn (including popcorn), rye, quinoa, rice (any type)
- Legumes: lentils, beans
- Oils: soybean, corn, sunflower, canola, margarine, any hydrogenated oil
- Liquids: any liquid containing sugar, cow's milk
- Sweets: sugar (any type), honey, agave

The above lists provide good general rules to follow. Note that the OK category contains no fruits (except avocados) and no alcohol. (More on alcohol options later.) Take much care to limit your intake of foods in the Less-OK category. Count carbs carefully for foods in all categories, and pay attention to portion sizes. Within months, many of my patients learn to take the Not-OK foods off the table completely so they pose no temptation. It is almost as if a switch is flipped in their brains, and they don't even consider



items that are off limits. Often, the ability to do this is the result of their weight-loss success. At that point, the low-carb approach often becomes ingrained, and they consider these off-limits foods both out of sight (kept out of the house and ignored on a restaurant menu) and out of mind. They achieve a lifestyle change.

As for liquids, let's make it simple: avoid calories in drinks as much as possible. Noncaloric liquids are best. Definitely avoid sweetened sodas. Same with energy drinks. Juices often contain lots of sugar (read the label—you will be surprised), so avoid juices or drink them in very limited amounts. Sweetened teas and coffees are to be avoided unless only artificial sweeteners are used. Cream in coffee should be full fat. Avoid sugar in coffee; instead, if needed, use artificial sweeteners in limited quantities.

We talked previously about the use of artificial sweeteners, but let's look at them in more detail. Controversy surrounds their use as part of a low-carb diet. There is some evidence that they can inhibit weight loss by causing the pancreas to release insulin. Despite not raising blood glucose, they may be an impediment to efforts to reduce insulin resistance. It's my belief that as patients attempt to limit carbs, completely prohibiting diet sweeteners is too strict. So artificial sweetener use is OK, but moderation is suggested. Some metabolic-health experts suggest that natural low-calorie sweeteners like monk fruit (often used in baking), stevia, and erythritol may be the best alternatives. Be aware that very, very recent studies have indicated erythritol may carry a limited risk of increased cardiac disease. So, please check on anticipated future research developments in this area before fully embracing the use of this artificial sweetener. Again, moderation is a good approach.

### **Blood Glucose and Alcohol—What You Need to Know**

Almost 60 percent of Americans drink alcohol at least monthly. So it's important to understand how alcohol affects a low-carb diet.

On a low-carb diet, intoxication may occur faster and with less alcohol. Usually, carb ingestion alongside alcohol consumption allows for some of the alcohol to be soaked up by the carbs in the stomach, which slows the alcohol's absorption into the bloodstream. So without these carbs present, alcohol will be absorbed more quickly. And protein and fat in the stomach do not absorb alcohol as readily as carbs do. So if you're drinking and limiting carbs, the common advice to eat something first to avoid intoxication may

be more difficult to follow effectively. That said, it's better to have food in your stomach than not when drinking. So if you are going to drink, eat something, even if it is mostly protein and fat.

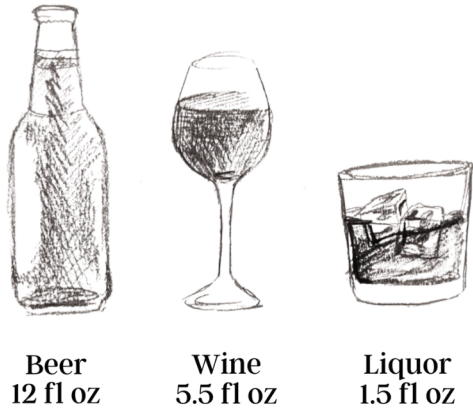
Drinking alcohol can slow down weight loss for a variety of reasons. For one, most alcoholic drinks contain carbs, often in significant amounts. Second, when alcohol is in the system, the body uses it directly as a fuel source, causing it to ignore the use of fat and carbs as an immediate energy source. In other words, if your organs are using alcohol as a fuel source, they are not burning carbs or fatty acids, and visceral fat breakdown is slowed. Also, alcohol lowers inhibitions, which can make you disregard carb-intake goals.

The best approach to alcohol is, of course, abstinence. I recommend to many of my patients who drink that for the first month or two, they try the abstinence approach. After that, just be smart about your alcohol use—don't let it impede your path to weight-loss success. If drinking, keep the alcohol use to a low-carb drink or two at any one sitting. And limit drinking to no more than a day or two a week. Carefully count the carbs you consume in your alcoholic drinks, making sure that any alcohol drinks you consume fit within your planned carb limits. Most beer brands list carb counts, but hard liquor and wine labels often do not.

Make sure to assess drink volumes accurately. For example, a standard serving of hard liquor is 1.5 ounces, wine is 5.5 ounces, and beer is 12 ounces. If you fudge these numbers and drink larger amounts, you will set yourself back.

Fewer carbs are always better, with zero-carb alcohols being one approach. Vodka, whiskey, gin, tequila, and other pure alcohols have zero carbs. Be aware that anything added to these drinks may boost carb intake. Adding ice or sparkling no-calorie soda is, of course, fine. But using juice or soft drinks as mixers racks up the carbs quickly. A rum and Coke has about 22 grams of carbs. Vodka and orange juice has 16 grams. A bloody Mary has about 8 grams. Diet tonic with zero carbs may be a good mixer option. Any sweetened liquor should be avoided.

If you do drink beer, watch the carbs closely. Light beers contain 3 to 5 grams of carbs. Regular beers have 10 to 12 grams of carbs, and some heavy beers can have up to 15 grams.



*Standard volume of various alcoholic drinks.*

Because beer contains a relatively large number of carbs, and more than one drink of hard liquor can cause risk of intoxication, wine may be a good alternative. Dry wines (red or white) contain only about 3 to 4 grams of carbs in a standard 5.5 ounce drink, so the drier wine options are usually best. Sweeter wines contain 5 or even 6 grams. Dessert wines like port can contain even more and are best avoided.

In summary, you can enjoy an occasional alcoholic beverage while on an aggressive low-carb diet. If you are on a less restrictive low-carb diet of 50 grams or more, more than a drink or two a week may be allowable. However, it is important to know the carb count and intoxication risks when consuming alcohol during your low-carb diet efforts.

## THE MANY LOW-CARB DIET OPTIONS

Let's talk about the different specific types of low-carb diets you should consider when using a CGM for guidance. Be aware that most of these diets have more commonalities than differences, so the differences at times can be somewhat subtle. For example, there is really not much difference between a basic low-carb diet and a low-carb, high-fat one. Reading between the lines,

you do not need to follow a specific diet as described. However, if you are looking for options, a variety of choices exist.

My patients have varied preferences. Some are intent upon adhering to the low-carb Mediterranean diet. A few are vegan. Some want to go keto. Still others are interested in the paleo diet. All options are fine with me as long as they keep accurate carb counts and stay at or under the limits we agree on.

And many of my patients utilize various components of different diets to achieve the result that works best for them. They mix and match. The beauty of using a CGM is that they then have hard data to tell them (and me) if their approach is working.

Below are the CGM-friendly diet options my patients use most. Many more low-carb diets exist, but the aim here is to help you find your individualized path to success, not overwhelm you with too many choices.

Picking any of the diet options listed here, counting your carbs, and tracking how food affects your blood glucose with a CGM will lead to good results. The specific type of diet you choose depends on your personal preferences. You should also consider your desired time frame to reach your goals. For example, a keto diet may help you reach your goal more quickly than one of the higher-carb options. But you will likely find keto much more challenging, at least at first. What matters most is picking a daily carb limitation and staying within that framework.

Once you choose an option, it may be appropriate to modify it later. For example, if you start with a low-carb Mediterranean diet but have difficulty controlling your carb intake, you may need to step it up to a more structured low-carb, high-fat diet. If you start with keto but decide after some progress you do not want to sustain it, a move to a less food-restrictive approach is appropriate. Flexibility is part of the beauty of going low carb with a CGM.

Now let's get into the diet types.

### **The Carnivore Diet (Essentially Zero Carbs)**

Just like the name says, this is a meat-only diet high in fat and protein.

The carnivore diet consists of eating only foods that fly, walk, or swim. Carb intake is negligible. It is a higher-protein diet. The primary foods include pork, beef, and lamb with a preference for fattier cuts to ensure adequate calorie intake. Poultry, fish, bone marrow, eggs, butter, lard, and

organ meats like liver, and even chitlins, are also included. (Some carnivores advocate using nearly every edible portion of an animal. In recent years this has become known as a “nose to tail” approach.) Most variations of the carnivore diet allow cheeses. Carnivore diets have a small but enthusiastic following. Some people stay on a carnivore diet for years.

The carnivore diet may be considered a form of keto diet, because patients on this diet soon reach a ketogenic state.

I believe this diet is somewhat aggressive and do not generally recommend it to my patients. However, if they want to pursue it, I support their effort.

Sometimes I have long-term low-carb patients who want to get into ketosis and at the same time pursue something “a little different,” so they give this diet a try. Most like it but do not stay on it indefinitely. After a few months, they go back to one of the other low-carb diet options. We don’t have a lot of research backing this diet’s benefits. My gut feeling is that without any plant-based nutrients, it is unlikely to be super healthy in the long term, unless care is taken to get all daily nutrient requirements as well. So individuals pursuing this diet should be on daily vitamins and supplements to ensure essential nutrient intake. Patients with certain medical conditions such as kidney disease or gout should avoid the carnivore diet.

### **The Ketogenic (“Keto”) Diet**

The goal of the keto diet is to transition the body’s energy metabolism from glucose burning to fat burning. It was developed in the 1930s to treat children with epilepsy. No one is sure why a ketogenic diet prevents seizures, but it is believed that the ketogenic state alters the brain’s metabolism, stabilizing brain tissue. Keto diets were the only alternative for the treatment of childhood seizures for decades until antiseizure medications were developed. Some pediatric institutions still use ketogenic diets (sometimes in combination with medications) to help control childhood seizures. This long-term use of the keto diet lends credence to its safety.

A lot of research has been done on the keto diet over the years. In addition to helping dieters lose weight, it is known to significantly reduce insulin resistance.

Ketones are breakdown products of fatty acid metabolism. When fat is being used as an energy source, ketones are created in the liver by a process called ketogenesis.

The keto diet can push fat consumption to as much as 75 percent of dietary intake. Many people are skeptical about eating so much fat because we have been led to believe that only low-fat diets are healthy. I have seen in some of my patients that high-fat keto diets actually lower their cholesterol slightly, and, in my experience, most achieve lower triglycerides. Remember that 80 percent of the body's cholesterol is produced by the liver, and only 20 percent is ingested. In my practice, I usually see little change in cholesterol on this diet if the patient has a high BMI to start. Triglycerides usually trend lower. Remember, triglyceride production is a result of glucose conversion to fat in the liver. If blood glucose is lowered, as it is in a ketogenic state, and this rate of conversion is reduced, fewer triglycerides are produced.

A typical keto diet is usually around 30 to 35 percent protein, 5 to 10 percent carbs, and 50 to 70 percent fat. In the transition to ketosis, some people have a transient feeling of fatigue, called the “keto flu.” This condition usually resolves in one to two weeks. Most patients experience reduced hunger levels once they achieve ketosis. Remember, increased fat ingestion causes satiety.

On a strict keto diet, you can usually eat unlimited quantities of food—with a tight limit on carbohydrates. So on this diet, neither counting calories nor, for the most part, even limiting food intake is necessary. Carbs, however, must be aggressively limited.

I have a number of new patients who have done some low-carb dieting previously who want to begin their CGM-guided eating with an aggressive approach. They start by going keto for three weeks, a month, or even several months. Later on, they loosen their carb intake, graduate to a low-carb approach, and evolve out of ketosis. With this approach, if the subsequent carb count is kept under 50 grams per day or so, they will, of course, keep losing weight. At this point, they like experiencing the relative “luxury” of 50 grams per day as this feels to most of them to be a relatively easy diet after being in the 20-gram range previously.

It has been suggested that a strict keto diet is very arduous to maintain long term. I don't agree. It is true that it's not for everybody, but a small

percentage of my patients have stayed keto for years. Some people see keto as a long-term lifestyle. Obviously, this is feasible as this diet has been maintained long term by pediatric seizure patients. I have had patients who say they just feel better in a keto state. They feel they have more energy and better mental clarity in ketosis. Some even say it provides a mild euphoria. They notice their mood is much improved. Given that ketosis has a proven effect on brain metabolism, it is hard to argue with this suggestion.

Ketones can be measured to assess when you arrive in ketosis and if you are staying there. Several techniques exist for this: urine strips, a breathalyzer, and finger sticks can all measure ketones. I usually recommend finger sticks. The KetoMojo device is the most popular finger-stick brand. (Urine strips are a bit messy, and sometimes it seems to me the consistency of readings with the breathalyzer devices is less than optimal.) One finger stick a day, usually recommended to be done in the afternoon, is sufficient. Ketone finger-stick devices cost about sixty dollars, with the strips costing a little less than a dollar apiece. The testing technique is almost exactly the same as the blood-glucose finger-stick evaluation using a glucometer that diabetics perform routinely.

The desired level of ketosis is 0.5 to 3.0 millimoles per liter (mmol/L). I am happy with my patients staying in the .8 to 1.5 range. When I have personally pursued a keto diet in the past, it has taken me about three days to achieve ketosis. I often check my numbers daily for a week or two. After that, if I am controlling my carb intake to where I want it (usually about 20 grams per day or less) I stay in ketosis and can back off on the daily finger sticks. Often, then, I just check my ketones once every three to five days.

Several subtypes of the keto diets have been suggested. We've already discussed that the carnivore diet often achieves ketosis. The high-protein keto diet replaces the high percentage of fat with more protein. On the targeted ketogenic diet, you consume most of the carbs you'll eat each day before exercising. Cyclical keto dieting alternates several weeks of keto with several months of bumping carbs to 50 grams a day; then the cycle repeats.

One variation of the keto diet is the Atkins diet, popularized in the 1970s. Dr. Atkins was demonized at first when he published his diet during the initial "low-fat, heart-healthy" days of the 1970s and 1980s. Most metabolic-health physicians now view Dr. Atkins as a trailblazer. His efforts

brought useful information to millions of people regarding not only low-carb diets and weight loss but also reversal of prediabetes, lowering medication requirements for diabetics, and overall improved metabolic health.

The formal Atkins diet has four phases; only the first phase is really ketogenic. This diet has historical significance as it really was the first widely recognized and embraced low-carb diet. You start with a ketogenic carb level and then add more carbohydrates in the form of low-carb vegetables, followed in phase three by a limited amount of grains. Patients do not move on to phase four (maintenance) until the targeted weight is maintained at a phase-three level of no more than 80 grams of carbs per day. The last phase focuses on weight maintenance, with carb limits adjusted accordingly. At this point, low carb has become a lifestyle. The cycle can be repeated if a person regains weight.

In recent years, the Atkins diet has been commercialized to sell meal plans. Some of these Atkins foods are far higher in carbs than you'd expect. I believe purchasing Atkins commercial products is unnecessary; this diet can be done independently with an appropriate selection of foods at the grocery store. Increasingly you can find foods at the store or on the internet labeled as low carb or even keto. These usually are foods with a high fiber content, so they will help you keep your net carbs low.

There are certain patients who should not pursue a keto diet. These include those who are pregnant and those with heart disease, as well as patients with compromised kidney function. Women who are breastfeeding should also avoid this diet. The keto diet is also unsafe for patients with pancreatitis and liver failure. Keto diets should also be avoided by patients with rare diseases such as fat metabolism disorders and porphyrias. However, for most people, a ketogenic diet is a viable option, especially for those who want to take an aggressive approach to low carb and achieve results early on.

One more comment on keto diets. There is increasing evidence that these diets may have very positive effects on the brain. We discussed mood improvement earlier. As we discussed, the potential beneficial effect on the brain of ketosis is lent credence by the safety and effectiveness of the use of this diet for kids with seizures. Some research has shown that this diet may slow the progression of Alzheimer's disease and may even help reduce the severity of depression. Many of my patients attest to this diet helping



them eliminate brain fog. A recently published book, *Brain Energy* by Chris Palmer, MD, a Harvard-trained psychiatrist, discusses these potential benefits and provides evidence of how ketosis may help with other mental health conditions like anxiety and PTSD as well.

### **The Basic Low-Carb Diet**

A basic low-carb diet involves eating no more than 75 grams of carbs per day. In my practice, as discussed, I usually suggest this more liberal target to a limited number of patients. I usually target 35 to 50 grams with my new patients, and we often keep that target long term, although some of my patients, once they get the hang of a low-carb diet, move themselves to 25 to 35 grams. I call this diet “basic” because nearly the entire focus is on limiting carbs. Essentially, the only thing that really matters is meeting the carb limit. I do also encourage the consumption of good fats and getting adequate amounts of protein. If a protein target is selected, it is usually about 100-to-125-grams-per-day. I rarely target a fat intake goal. Basically, it is a simple plan: keep your carbs under 50 grams, try to get 100 grams or more of protein, and don’t worry about counting fat. As always, healthy fats are preferred.

As mentioned previously, my experience is that starting at higher levels of carbs makes the gradual reduction process slower and more painful. I feel it is better to jump in with two feet. Since the average American consumes 300 grams of carbs per day, going down to 50 can be a dramatic change on paper. However, that change is mostly mental, with little if any negative physiological impact. I find the majority of my patients do well with this transition, even in the first few weeks.

If you start in this 35-to-50-gram range, you’ll have to avoid some foods altogether, like those on the “Not-OK” list from earlier in this chapter. But there is flexibility in this diet; it is not a preprogrammed diet with a lot of rules. It allows you to select which foods you eat and how much to eat within the carb limits allowed. Also, again, you can always eat *something*, as long as the food has few or no carbohydrates.

### **The Low-Carb, High-Fat Diet (LCHF Diet)**

This diet has also been called the Scandinavian diet, since the populations of countries such as Sweden have embraced this way of eating. Another

name for the LCHF diet is the Banting diet or just Banting, after William Banting, a nineteenth-century British man who popularized it after losing a large amount of weight.

Embracing a LCHF diet is sometimes considered somewhat of a lifestyle change. This is because a mindset evolution must take place away from the ingrained low fat, reduced fat diet, to a diet much higher in fat percentage. Carbs make up about 15 percent of this diet, fat makes up 60 percent or more, and protein makes up the rest. Relative to these numbers, this diet is not that different from the basic low-carb diet. Processed foods, starches, and most fruits are cut out nearly altogether. Whole, unprocessed foods are the foundation of this dietary approach.

This diet includes eggs, fish, low-carb vegetables, and nuts. So, while fats are encouraged, fat content in processed foods should be avoided. (Remember, processed foods contain mostly unhealthy seed oils.) Fatty meats, full-fat butter, creams, cheese, avocado, and olive oil are included in the LCHF diet.

Daily carb intake on an aggressive LCHF diet may be as low as 30 grams. But once your weight-loss progress has been achieved, in a maintenance phase, this goal can be relaxed to up to 50 grams or even higher. At lower carb levels, fat's satiating effect helps you control how much food you eat. I believe a LCHF is a great option for patients seeking a sustainable weight-loss approach.

I have not, in general, seen significant changes in cholesterol with my patients utilizing this diet. But remember, as I discussed in Chapter 2, my patients self-select for my practice with the vast majority having high BMIs. Remember, the exception to this usual lack of cholesterol change is the occasional thinner patient who wants to pursue a low carb, high-fat diet. These patients initially come to me primarily for improvement in metabolic health (for example, seeking to lower hypertension). For these patients, we do adjust their diet to a lower fat intake if we see cholesterol going up. This is a rare type of patient in my practice, usually with a genetic predisposition to high cholesterol.

### **The Paleo Diet (Low-Carb Paleo)**

The well-known paleo diet, in a general sense, is not always low carb. It may contain up to 250 grams of carbohydrates per day. However, the low-carb

variant of this diet features the fundamentals of a paleo approach with far fewer carbs. This diet is very appropriate for use with a CGM.

This diet's name comes from the Paleolithic period, about 2.5 million to 10,000 years ago. The idea is that the paleo diet resembles what was eaten before agriculture became widespread. It is the “caveman” diet.

A paleo diet involves lean meats, fish, fruits, roots, nuts, and seeds—foods that, in the past, could be obtained by hunting and gathering. Foods that became more common after farming became widespread are excluded.

Though this diet eliminates most grains, it may contain some legumes and all types of nuts, as well as some fruits and vegetables. This means that close attention must be paid to carb limits. Remember that today most fruits are genetically modified to contain a lot of sugar. The main advantage of this diet is its avoidance of processed foods, including processed sugar and grains.

My advice to my patients is that to make this diet low carb, only vegetables low in carbohydrates such as cucumbers, cauliflower, peppers, and leafy greens should be included. The only fruits consumed should be berry fruits like blueberries and strawberries, and these should be consumed in limited quantities. Grains should generally be avoided. So should cashews. All nuts on the Less-OK list should be eaten only in small quantities.

A low-carb paleo diet can be effective for weight loss. Its emphasis on avoiding processed food is a plus. However, limiting the number of carbs must be an integral part of this dietary effort.

### **The Low-Glycemic Index “Diet”**

We have previously discussed the concept of low-glycemic foods (Chapter 5). This is not necessarily a specific diet, but it is an important concept. Understanding the glycemic index (GI) can help CGM users avoid blood-glucose spikes which impact their level of insulin resistance. Remember, high-glycemic foods are absorbed in the gut quickly and cause blood sugar to go up somewhat fast. After the spike, blood sugar then often comes back down in a short period of time (sometimes resulting in hypoglycemia if pancreatic insulin release overshoots the mark). Low-glycemic foods cause blood glucose to rise more slowly, usually not reaching as high a level, but then blood glucose may stay elevated for a longer period of time.

Remember: every food that has carbs has a glycemic index number. The ratings run from 0 to 100. For example, a baked potato has a glycemic index of about 85, but carrots have a glycemic index of only 45. This means that potatoes will spike your blood sugar higher, but your blood sugar will also come down more quickly than with the lower-GI carrots. In contrast, carrots will cause a lower elevation of blood sugar, but it will stay elevated for a longer period of time.

Note the absence of a direct correlation with sugar content. While foods high in sugar tend to have higher glycemic indexes, the relationship is not exact. That is because foods with high sugar content may be digested more slowly, and foods that are low in sugar may be digested more rapidly. The amount of fiber in the food plays a role here. Fiber slows carb absorption.

You can find plenty of glycemic index tables and references on the internet. But for convenience I will list the GI of a some more common foods here:

### ***High Glycemic Index***

- » French fries: 90
- » Oatmeal: 90
- » White rice: 90
- » White bread: 80
- » Breakfast cereals: 75
- » Doughnuts: 75
- » Sweet onions: 75
- » Beets: 65
- » Pineapple: 60

### ***Medium Range***

- » Brown rice: 55
- » Banana: 50
- » Carrots: 45
- » Milk: 40
- » Yogurt: 40

### ***Low Range***

- » Broccoli: 10
- » Asparagus: 15
- » Peppers: 15

For CGM users, seeking low glycemic index foods helps avoid high blood glucose spikes. So having a general idea of glycemic index (in addition to carb counts) can provide additional guidance while using a CGM.

For CGM users, seeking low-glycemic index foods helps avoid high blood-glucose spikes. So having a general idea of glycemic index (in addition to carb counts) can provide additional guidance while using a CGM.

This being said, determining both exact carb counts and glycemic index values of all the foods you eat can be cumbersome and time consuming. So my preference is to have patients count carbs while being generally aware of the glycemic indexes of the foods they eat. Again, I don't recommend a stand-alone glycemic index diet, but glycemic index considerations can be incorporated into just about any low-carb diet approach.

### **Mediterranean Diet (Low Carb Version)**

Countries bordering the Mediterranean Sea, such as Italy and Greece, have lower rates of heart disease than many other parts of the world. And the diet derived from that region has been shown to lower the incidence of cardiac issues (heart attacks and congestive heart failure), even when this diet is followed by people in other parts of the world. This diet has been popularized in the US in recent years. Be aware that the Mediterranean diet is not always low carb. It contains grains and fruits, even bread and pasta.

This is a diet of vegetables, fruits, whole grains, beans, nuts, and seeds. Fish and olive oil, both high in omega-3 fatty acids that raise good cholesterol and lower bad cholesterol, are also major components.

One primary difference between this diet and the ones we already covered is that it partially swaps saturated fats for unsaturated ones. It also usually has more fish than red meat.

Almost 50 percent of your daily calories on the traditional Mediterranean diet will be carbs. So this diet needs to be significantly modified to be adopted to a low-carb approach. In its standard form, to achieve weight loss, calories and portion sizes need to be restricted with this diet. I feel it important to make my patients aware of some of the beneficial aspects of this type of diet (high in omega-3s) but feel it requires significant modification (removing pasta, grains) to be effective for weight loss. This diet was not originally intended as a weight-loss diet; its focus has always been on heart health.

If a person chooses to modify the Mediterranean diet to remove pasta, bread, grains, and fruit, they can achieve weight loss comparable to other low-carb diets. However, a low-carb goal needs to be targeted. In my experience, this is somewhat difficult to achieve, and one of the simpler low-carb diets is preferable.

### **Diets That Avoid Red Meat**

What if you want to restrict or otherwise limit your meat intake? I work with occasional patients who follow diets that avoid red meat (and even rarely some that avoid red meat, poultry, and fish altogether). If only red meat is to be limited, the main protein sources should be poultry, fish, tofu, and legumes. (Be careful with the carbs in the legumes.)

### **Diets That Avoid Red Meat and Poultry**

A pescatarian is a person who eats a vegetarian diet (see below) but also eats fish and other seafood. So pescetarianism is eating a vegetarian diet with seafood for protein. A low-carb diet of this type is also achievable. However, again, it is much more challenging to implement without the option for red meat and poultry.

### **Vegetarian Diets**

Vegetarian diets cut out meat but include animal products such as eggs and cheese. A vegetarian low-carb diet usually includes about 25 percent protein, 45 percent fat, and 30 percent carbs.

Vegetarians looking to lose weight by limiting carbs often seek high-quality proteins from a variety of non-meat sources. These sources include eggs, dairy, tofu, nuts, beans, and veggie burgers, as well as synthesized meats such as Beyond Meat and Impossible Burger. For my rare patient who is vegetarian, it has been very helpful for them to include whey protein powder shakes and low carb protein bars as well.

Almost 50 percent of this diet is made up of fat (like many other low-carb diets), so quality fat sources are again important. Fats rich in omega-3 fatty acids such as olive oil and the fat in avocado are an important part of this diet.

Low-carb vegetarianism takes discipline. Few long-term vegetarians seek my services. However, I do very occasionally work with new adherents

to the vegetarian lifestyle who want to continue on that course but work with me using a CGM to lose weight. They are often very disciplined and compliant patients who achieve weight-loss success with the guidance of their CGM.

### **Vegan Diets**

A low-carb vegan diet is quite restrictive. Vegans avoid all food derived from anything that walks, flies, or swims—including honey, eggs, cheese, butter, milk, cream, and other dairy products. Large quantities of healthy fats, such as olive oil, are included in this diet.

This diet requires increased protein ingestion (about one gram per pound of ideal body weight) since plant proteins are not digested by the body as readily as animal proteins.

This being said, following a low-carb vegan diet is technically possible. I have a medical colleague who has maintained optimal weight for years on this diet, but she was not heavy to begin with, so she did not have the need to lose weight on this diet originally. And her daily carb limit is generally in the 75 to 100 range. Because carb limits in comparison to more mainstream low-carb diets need to be significantly loosened for vegan patients, weight loss is consequently much more gradual and weight-loss goals often more difficult to obtain.

### **Other Commercial Diets**

Diets such as Weight Watchers, Jenny Craig, and Nutrisystem offer prepared foods for purchase. If patients desire the convenience of prepared meals with the carb count on the label, I support that. My preference, however, is that my patients gain a deeper understanding of nutrition and carb counts by preparing their own meals. This is usually a less expensive approach as well. That said, I realize that sometimes patients with jobs and families need some convenience. Just remember: always check food labels and maintain accurate carb counts.

## **THE BEST DIET FOR YOU? CONSIDER CHOICE, PERSONALIZATION, AND SUSTAINABILITY**

With such an array of choices, all patients can choose the low-carb diet that works best for them. And personal choice is important in this area. Diets are, by definition, restrictive. Having the autonomy to select not only your diet type but also the specific foods you eat within carb limitations is important. Having control over this process leads to long-term sustainability, no matter what diet you choose.

The most common diets my patients select have a few collective premises. Starting in a low relative carb range is a good idea. Starting as high as 75 grams is fine, but patients will not see the same early progress as if they started at 35 or 50. Keto is an option for those patients who want to get aggressive early on.

What I have described in this chapter are multiple variations on the low-carb theme. And I welcome individual choice by a patient of what they feel is the best option for them. I, and their CGM, provide guidance. If carb goals are met, adequate protein included, and good fats selected, success is very likely no matter what particular route the patient chooses.

Immediate feedback based on CGM numbers drives success. For a patient to see their average daily glucose go from 130 to 90 provides great encouragement. For a patient to see glucose spikes go from 180 to no more than 130 is similarly satisfying.

Picking a specific diet that is sustainable long term is preferable but not mandatory because once an approach is selected, it's not set in stone. It can be modified as needed. Going on a diet usually means a significant lifestyle change, and the process should be as easy and flexible as possible. You can change from one low-carb diet to another anytime you choose. After all, your health is on the line, so sustainability is key.



## CHAPTER 7



# HOW FASTING AND CARB CYCLING CAN IMPROVE OUTCOMES

**A**s you probably know, fasting is the voluntary act of not eating for a specific period of time. In popular use, *fasting* is what people mean when they delay eating for four or more hours while awake. (I know this seems like a short period of time, but most of us have been conditioned since childhood to eat snacks between meals.) Along with carb restriction, fasting is one of the most powerful and effective dietary interventions for weight loss. This is especially true for people with insulin resistance. But it is even helpful in achieving weight loss for individuals who do not have high blood glucose or insulin issues.

Religious traditions have embraced fasting for thousands of years. Also, our hunter-gatherer ancestors were used to functioning for extended periods without food. For them, this was not voluntary. After a successful hunt, food would be available, but when the hunt was unsuccessful, fasting was obligatory as a result of lack of food availability. And we still have the evolutionary ability to fast, even though most of the US population has food at our fingertips 24-7.

We need to make a distinction clear: lack of access to food is not the same as purposeful fasting. Remember, fasting is *voluntary*. Most Americans

consume food every three to four hours when not sleeping. However, a limited subset of my new patients arrive in my office having previously practiced fasting, even up to sixteen hours per day. For others, going without food for more than ten hours is a big deal. If they have not fasted before, I start most of my patients with fasting overnight for about ten to twelve hours, then we gradually increase their fasting time from there.

Proper fasting should not cause suffering. There is some hunger involved, but most of my patients derive a great sense of satisfaction from not only the resulting weight loss but also the fact that they can fast successfully. They feel good about the discipline they have been able to demonstrate and their successful accomplishment of a fast.

And fasting should not be considered an unusual act. Think of the term breakfast. This word's mere existence acknowledges fasting as a normal part of everyday life. After all, everyone's used to going eight hours without eating while they sleep. Think of voluntary fasting as extending this abstention from food for various additional periods of time into waking hours.

But why does fasting work? Let's explore the biological mechanics of this ancient practice.

## THE PHYSIOLOGY OF INTERMITTENT FASTING

When we eat carbohydrates, the current energy needs of our organs are supplied by absorbed blood glucose. Extra glucose is stored in the liver and skeletal muscle as glycogen. The liver changes some of that glycogen into fat for later use. Some fat remains in the liver (if excessive, this is fatty liver disease), but most is transferred to the fat stores around our middle, our visceral fat.

As we've discussed before, the key hormone involved in energy storage is insulin. This hormone is released when we consume carbohydrates to assist in providing energy to our organs and to facilitate the fat-storage process. When glucose excessively saturates the blood, a lot more of it gets eventually converted to fat.

But when we fast, blood glucose goes down, and that process is reversed. Insulin release is diminished. Less glucose is available to be absorbed by our organs to be used immediately for energy. The body must then use stored

energy. It uses any stored glycogen in the muscle and liver first. However, when those energy sources are depleted, the breakdown of fat into fatty acids occurs. The body's glycogen in the muscle and liver is usually depleted in about twenty-four hours. But a shorter-than-twenty-four-hour fast can aid the eventual depletion of that glycogen by decreasing glycogen stores (especially in the liver) to below-baseline levels. Once glycogen is depleted, fat will primarily continue to be the energy source until carbs are eaten again, and blood glucose rises.

The lower insulin levels during fasting help reduce long-term insulin resistance. But other hormone changes also occur during fasting. Fasting also causes the release of adrenaline. In this case, your body is responding to the stress of not having readily available glucose as an energy source. Adrenaline further accelerates the breakdown of body fat into free fatty acids.

Another hormonal change that occurs during fasting is a rise in human growth hormone (HGH). Some studies have shown a threefold rise in HGH during fasts. HGH helps build, maintain, and repair damaged body tissues. Like adrenaline, it also assists in speeding up fat degradation. HGH can also help prevent muscle loss. This means that patients who pursue intermittent fasting as part of their weight-loss routine (assuming adequate overall energy intake) can preserve muscle mass better than those who do not fast. It's a win-win situation: both fat breakdown and muscle-mass preservation are geared up with fasting.

## **WHO SHOULD BE CAREFUL ABOUT OR AVOID FASTING?**

Diabetics on insulin or oral medications that lower blood glucose should be careful about fasting. CGMs allow 24-7 blood-glucose monitoring for diabetics who do fast, so blood glucose can be carefully monitored. Very individualized medical advice should be obtained regarding fasting for any diabetic on blood glucose lowering medication who wants to include it as part of their weight-loss plan. If a diabetic patient chooses to fast, caution must be taken so the combination of the fast and diabetic medications do not result in potentially dangerous low blood sugar. That being said, I have never had a diabetic patient on blood glucose-lowering medications have

a significant hypoglycemic episode while fasting. And the CGM would almost certainly be an effective warning system should this scenario occur.

I do have many diabetic patients who fast effectively, and this assists with both their blood-glucose control and their weight loss. Some of those patients are on medications like insulin that can potentially cause hypoglycemia. But not all diabetic medications cause hypoglycemia. Examples of diabetic medications that do not include Ozempic and metformin.

Fasting is also a great tool for prediabetics as it helps lower insulin resistance and can aid in the prevention of progression to diabetes.

Fasting can be a great tool to assist diabetics in achieving complete or partial remission of their disease. A diabetic in complete remission is still diabetic, but they have achieved the ability to stay off diabetic medications, sometimes for years, usually with better blood-glucose control. Partial remission means medication doses can be reduced (but not eliminated), again with improved blood-glucose control.

In the case of patients with heart disease, the safety of fasting depends on the specifics of the individual's condition. For these patients, individual physician consultation is needed. Patients with gout or high uric acid levels should also mostly avoid fasting. So should patients with liver and kidney disease. Anyone with a history of weight-loss disorders or a BMI lower than 20 and women who are pregnant, attempting pregnancy, or breastfeeding shouldn't fast at all. Though there is no strict upper age limit for fasting, people over seventy should employ moderation related to their fasting regimen. At the younger part of the age curve, prudent fasting may be appropriate for some obese teenagers attempting to lose weight.

If you have any of the above conditions or other disorders that may affect the safety of fasting, talk to your doctor or a metabolic-health specialist before embarking on a fasting regimen. Some conditions preclude fasting, but for the majority of people, fasting is a great approach to help with weight loss, reverse insulin resistance, and improve metabolic health.

## FASTING REGIMENS

My patients fast at their discretion, but I encourage some fasting if they have insulin resistance and/or if they want to achieve early weight-loss

results. Fasting approaches can be divided into shorter (less than twenty-four hours) and longer (twenty-four hours or more) protocols. The shorter approaches are done daily (or nearly daily) while the longer approaches are done on a periodic basis, usually once every week or two. Of course, lots of noncaloric liquids should be taken during any fast to avoid dehydration.

The term *intermittent fasting* does not have a hard-and-fast definition relative to the length of the fast. The term intermittent applies more to a fast that is voluntary, with a planned endpoint. This is contrasted to a starvation situation in which food is not available.

A continuous glucose monitor can help spot periods of hypoglycemia during a fast. But in my experience, clinically significant hypoglycemia is very rare. Some patients do experience some fatigue and maybe some occasional limited little lightheadedness, but these generally pass with rest and increased fluid intake. With repeated fasting experience most patients accommodate going without food and generally are symptom-free. In fact, many often feel energized during their fasts. Some will go into ketosis during fasts, depending on their carb-intake regimen and the length of the fast. Recall our discussion that some patients in ketosis achieve a feeling of increased energy and improved mental clarity. Even without entering ketosis (shorter fasts), I have found that many of my patients have a feeling of improved well-being with fasting.

### **Shorter Fasts**

I don't push any of my patients to begin fasting if they do not want to. However, nearly all want to at least try this technique. Most embrace it to one degree or another once they have tried it. If a patient has not fasted before, we usually start at a ten to twelve-hour overnight fast and build from there.

The most common shorter fast is the 16:8. This consists of eating all food on a given day within eight hours. For most people, this means skipping breakfast and consuming all food between 11:00 a.m. and 7:00 p.m., though some do eat breakfast and have an early dinner, making their eating time frame 8:00 a.m. to 4:00 p.m.

We've had it pounded into our heads that breakfast is the most important meal of the day. I do not believe this is true for patients seeking to lose weight. Numerous studies have found that people who skip breakfast

do not compensate by eating more food over that twenty-four-hour period. Also, there are no significant metabolic rate differences between the nonfasting and fasting study groups (the latter group skipping breakfast). So it is a misconception that eating breakfast increases your basal metabolic rate for the day to help you burn more calories. I believe that the selling of breakfast as the most important meal of the day largely has come from food manufacturers and processors who want to sell more cereal, toaster waffles, and Pop-Tarts.

After accommodating a bit to shorter fasts, I ask most of my patients to do a 16:8 fast just a few days per week and maintain a shorter fast on other days. Then I ask many to consider keeping a 16:8 fasting regimen daily, except for special occasions. For example, a family may have a tradition of going out to breakfast on weekends, and if that means an early breakfast occasionally, that is fine. If there is a special-occasion dinner that goes late and the fast is shorter on that day, that is fine as well. A pattern of frequent fasting is the goal; lifestyle disruption is not.

Some patients who succeed at 16:8 fasting proceed to 20:4 fasts. This means all eating is compressed into four hours each day, often 4:00 p.m. to 8:00 p.m. Several of my patients keep this fast daily. But other 16:8 patients will throw in a 20:4 fasting day just once a week or so.

## Longer Fasts

Keeping longer fasts puts patients in the big leagues of fasting. These are my most motivated patients. The twenty-four-hour fast involves fasting for a day, often between lunch or dinner on two consecutive days. This is also called the OMAD or “one meal a day” fast.

It’s simple; you just don’t ingest anything other than noncaloric fluids for twenty-four hours. My patients who choose to do a longer fast of this type (about 10 percent) do so about once every week or two. I suggest they try a number of 20:4 fasting days before they proceed to a twenty-four-hour fast.

The 5:2 fasting variation has become popular in recent years because it helps significantly limit food consumption and, therefore, helps with weight loss. In a 5:2 fast, during a given week you eat normally (which may include routine twelve-hour daily fasts) for five days and then fast for two twenty-four-hour periods. (By normally, I mean “low-carb normally.”)

The traditional 5:2 has a protocol that on those two fasting days, you can consume up to 500 calories. Of course, I tell my patients to focus on carb counts on those days and not calories and take any food they eat in a single sitting. I have only a handful of patients on the 5:2 at any given time. My preference is that patients keep it simple by doing their normal fast (twelve, fourteen, or sixteen hours) and then just throw in a twenty-four hour fast periodically.

On a thirty-six-hour fast, you eat dinner on day one, eat nothing on day two, and extend the fast until breakfast on day three. I love it when a patient of mine embraces this longer fasting approach. It is an indication of how serious they are about their weight loss and metabolic health. Patients embracing this challenge usually get a great sense of accomplishment and often can't wait to tell me about their achievement. Long fasts like this, of course, help with both weight loss and insulin-resistance reduction. Usually, a thirty-six hour fast is only done once every week or two.

Occasionally, I have patients who want to fast for longer than thirty-six hours. I don't push this, but I fully support their effort if it is not excessive. In general, I think the fasting patterns described earlier are usually adequate for achieving weight-loss goals, and I don't think the longer fasts add a lot. That being said, longer fasts, if done correctly, are rarely likely to be harmful. Our ancestors frequently fasted for many days during times of food scarcity. If one of my patients chooses to pursue a two or three day fast I support them if this is very occasional and if they build up to this duration of fast and commit to maintaining adequate hydration. I think a three-day top end limit (no longer) is reasonable.

## **WHAT TO EXPECT WHEN FASTING: BLOOD GLUCOSE, IMPACT OF EXERCISE, AND FASTING SYMPTOMS**

### **Blood Glucose**

Unexpected blood-glucose elevation may occur when fasting. This is because the body is using its glycogen stores. Remember, fasting also releases adrenaline, which can, at times, raise blood glucose. You're still getting most of the benefits of fasting, even if your blood sugar is a little higher

than you would like to see it. Don't worry about the higher initial blood-glucose pattern; blood glucose comes down as glycogen is progressively depleted. And, of course, with your CGM, you will be able to follow these numbers precisely. Most of my patients enjoy seeing the low, even curves that invariably occur on their CGM during fasting (even if slightly delayed by glycogen release from the liver or the effect of adrenalin).

### **Exercise During Fasting**

Exercising during fasting is not an issue. I have done this myself, and none of my patients have had any significant problems with exercising during fasting. In fact, exercise during fasting promotes weight loss because you're often burning relatively more stored energy (first glycogen, then fat). It is true that without carbohydrate intake, some people may not experience normal energy levels. But most patients acclimate to working out on an empty stomach, with excessive fatigue during workouts not being an issue.

In my experience, the best forms of exercise during fasting are shorter workouts, which may include both resistance and aerobic training. Fasting may be difficult during long-duration aerobic exercise (for example, long runs) because of a lack of glucose and even glycogen stores. Instead, I suggest short, aggressive cardiovascular sessions—under a half hour. Standard one-hour workouts for strength training are fine. It's also important to consume electrolyte drinks like calorie-free Gatorade and Pedialyte to replace sodium lost during exercise.

Competitive athletes will not benefit from fasting during competition. However, some studies suggest that fasting during training may enhance performance at competition time.

### **Potential Side Effects of Fasting**

The most common unwanted side effect of fasting is, of course, hunger. You can mitigate it by building up your fasting duration over time. Your body will accommodate.

As we discussed, it is fine to start at ten- to twelve-hour fasts, then progress to longer periods. I believe that having previous experience with a low-carb or keto diet helps patients transition to fasting more easily. Remember that hunger often results from hypoglycemia because of a rise in insulin levels following blood-sugar spikes from carb intake. Blood sugar



then drops (hypoglycemia) when insulin release overshoots the mark. When these peaks and valleys are evened out with low-carb dieting and fasting, hunger becomes less of an issue.

It is important to understand that hunger comes and goes in waves. It is usually not constant. On an intermittent fast, hunger does not keep building to unbearable levels. Instead, it usually builds up but then often spontaneously resolves after a period of a few hours. To prevent severe hunger, stay well hydrated. Drink water, tea, coffee, or other noncaloric beverages; even limited use of diet sodas is permissible. You should also stay busy; a day filled with work, errands, or time with friends and family combined with other activities (working out) makes the fasting period much more manageable. I find most of my patients sleep well during a fast.

Fasting can lead to smaller bowel movements and a problem with constipation. Again, hydration counters the latter risk. Instead of laxatives, we ask our patients to use sugar-free fiber supplements such as Metamucil. A magnesium supplement (magnesium oxide 400 to 800 mg per day) is always a good idea and also helps avoid or relieve constipation.

Headaches and lightheadedness aren't uncommon initially when fasting. They usually resolve after the first few fasts. It has been suggested that salt-containing beverages (again, sugar-free Gatorade or Pedialyte) help with fasting headaches.

Refeeding syndrome is a more serious side effect of fasting, but it's rare. It occurs because of excessive eating at the end of a fast and consists of bloating and abdominal pain. But refeeding syndrome usually only happens with fasts of several days or longer. After fasting, as you reintroduce food with whichever low-carb diet you choose, it is important not to binge. Begin intake with fluids, then progress with your chosen diet, eating slowly and deliberately and not overeating.

Most fasting side effects are manageable and don't require you stopping your fast. However, if you become persistently dizzy or weak, break the fast. And contact your doctor if symptoms don't resolve after you eat.

## CARB CYCLING

Though not fasting as such, some patients benefit from a related technique: carb cycling. Cycling goes both ways. Sometimes, counterintuitively, temporarily increasing carb limits can provide a break in the routine and be an effective strategy. Sometimes, lowering the carb target aggressively for a limited period of time works. The key, in my experience, is working some variability into your program. In previous chapters, we have touched on the fact that changing things up can provide both physical and mental benefits.

Alternating or cycling periods of lower and higher carb intake can avoid potential dietary monotony. I collaborate with many of my patients in setting up carb-cycling patterns that help them meet their goals. Though it seems like the opposite would more likely be true if carb limits are being liberalized, a change sometimes helps a patient break through a period of being stalled with their weight loss.

Here's an example: A patient eats 35 grams of carbs per day for three or four months and has shown great progress but is now having trouble reaching this relatively low daily target. In a situation like this, cycling may be helpful. We will collaboratively put a plan together raising the carb limit to 75 grams daily for a couple of weeks. That patient will then return to 35 grams, feeling refreshed by the variation, after the two weeks are up.

Patients seldom gain weight during the higher-carb period. Their weight loss may slow (or even stop), but they usually don't gain weight back. And they feel like they're in hog heaven because of their increased carb allowance. This limited change lets them consume foods they haven't eaten in a long time. It's refreshing and provides a great mental break. And when they return to the lower carb limit, they usually have no problems. With the temporary break from the rigorous low-carb level, they often come back with renewed motivation and optimism. Going back to their previous carb limit allows them to overcome the stall in weight loss they previously experienced. I believe the process of and improved metabolic health is not a "sprint", it is more like a marathon or even a journey. Adding some variation may mean it takes a little longer to reach goals, but it makes the process both more enjoyable and more sustainable.

## Another Example of a Carb Cycling Pattern

Instead of bumping up carb limits, sometimes taking the opposite approach is helpful. I'll work with patients to lower carb limits—say, going keto for a one- or two-month period. Then it is back up to the higher limit. An example might be going down to 20 grams per day from 50 grams, then bumping back up after several months.

As an alternative cycling plan, some patients use “cheat days,” or a one-day higher-carb period. In this pattern, a patient at, for example, a 35-gram-per-day limit selects one day every few weeks to bump up the carb limit, providing a mental respite from low-carb restrictions. A day at 75 to 100 grams for some of my patients seems like nirvana. They are then ready to “get after it” again. They often do their cheat day in association with a planned event like a special dinner at home or date night with a spouse.

No matter the pattern, carb cycling, if well thought out and planned, usually doesn't throw patients off track. And it often facilitates further weight loss progress. Almost all can return to their previous patterns to resume their weight-loss progress. I believe that the variability in and of itself can be helpful. Mixing things up a bit provides both respites and welcome new challenges.

Of course, CGM data will change while cycling at higher carb limits. Patients accept these temporary higher numbers but then often become a little anxious that their numbers are not where they want them. So they are then usually very ready to return to the lower carb limit and resume progress toward their ultimate weight-loss goal. They enjoy seeing those lower numbers on the app again.

## Intermittent Keto Cycling

As alluded to above, a good option for many patients is pursuing a ketogenic state on an intermittent basis. Let's talk a little more about this approach. Many of my patients choose to cycle in and out of ketosis to manage their weight and metabolic health. I have also managed my own health with the following keto/low-carb cycling approach: several weeks at 20 carbs per day followed by several months at 50 per day.

Some patients choose to manage their weight long term with periodic ketosis. They go keto, reach a weight goal, then cycle up their carb intake

moderately. If they gain a few pounds at higher carb allowances, they repeat the ketogenic phase, nearly always returning to their target weight goal. I have not seen or read about any ill effects of this approach. Remember that our prehistoric ancestors would feast when the hunt was good but eat much less, no doubt often entering ketosis, when times were lean.

There are no strict rules for keto cycling, but I do think that if you get into ketosis, you are likely to benefit by staying in ketosis for at least a few weeks. It often takes two to five days to get there, so if you do the work of getting there, you might as well maintain it for a little while. Time frames to reach ketosis can vary from person to person, so after you have gone keto once, you can estimate your time to ketosis based on your previous personal experience. Remember, some people embrace the ketogenic lifestyle wholeheartedly and stay in ketosis for months or even years. So for my patients who want to cycle there occasionally, I fully support that.

Remote ketone monitoring is available. I have a handful of patients who use KetoMojo devices to monitor their ketones. Using their connected phone app, their ketone levels are recorded, and then transferred to their personal KetoMojo website. These patients then provide me permission to monitor their data on the KetoMojo dashboard site available to medical providers.

Whether fasting or carb cycling, controlling when you eat matters. Maybe not quite as much as controlling what you eat, but fasting and cycling can very much impact your weight loss success. And the path to metabolic health involves more than just avoiding carbs and the timing of your meals. You have to put that improved feeling of well-being to good use.

In other words, you have to exercise some to complement your dietary effort. But it's not just a matter of getting on the treadmill or taking a power walk. There is a secret to lowering insulin resistance and blood glucose with exercise. Read on...

## CHAPTER 8



# GET OFF THE F#GD@! CARDIO MACHINES (AND INTO THE WEIGHT ROOM)

“Just move more.” Though good and well-meaning guidance from your doctor during your checkup, it is unfortunately advice that is not very helpful.

This piece of ubiquitous weight-loss guidance can be misleading and misses much of the essence of how to achieve the best results. Simply working out a little, without a focused plan, does not result in significantly improved health. Yes, *some* exercise is better than no movement, and obesity is correlated with a sedentary lifestyle. Nonetheless, “just exercise” does not provide a lot of direction. (And with 50 percent of doctors being overweight themselves, you might receive that advice with a bit of skepticism.) You need to know what type of exercise to pursue, how to allocate your precious exercise time, and why the regimen you are choosing will help you meet your weight-loss and metabolic-health goals.

Physical activity can affect diet program success. Some of this impact can occur from increased calorie expenditure. But as mentioned before, I’m not a big fan of the calories-in-calories-out method of weight loss because for most people, trying to limit energy consumption in comparison to energy expenditure does not work long term. Expending calories with exercise can

be somewhat helpful, but I don't believe it should be the primary goal of exercise. The saying is "You can't outrun your fork."

There are many other reasons increased physical activity helps with weight loss. These include increasing lean body mass and increasing absolute muscle mass. It can help with mobility and flexibility, even bone density. Exercise can affect insulin levels and, consequently, fatty acid utilization as an energy source. The result is improved hormonal balance and associated weight loss and improved mood and energy levels. But it is not just an energy balance issue. It is a hormonal issue. And insulin again is the star hormone. So, then, what is the best exercise regimen to address insulin resistance?

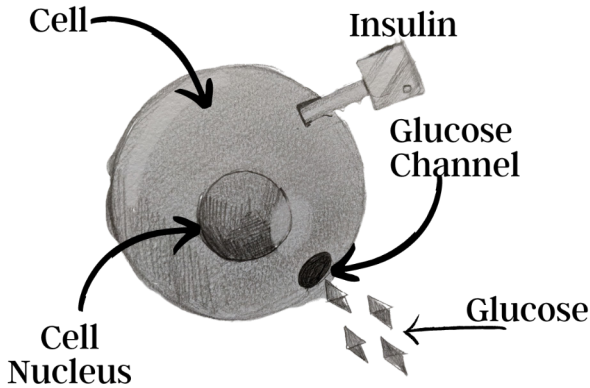
## **HOW MUSCLES "SOAK UP" INSULIN AND GLUCOSE**

Earlier in this book, we talked about the insulin receptors that coat the cells of our organs. These organs require a constant fuel supply, and these receptors are the keylock to the most desired fuel—blood glucose—that organs seek. Insulin is the key. Once the key is put in the lock, the door can be opened for blood glucose to enter to provide fuel. Our muscle groups play a major role in this energy balance because our muscles form one of the body's largest organ systems. When insulin molecules from the bloodstream unlock the muscle cell insulin receptors, the receptor cells assist in pumping glucose into the muscles to provide them energy. This makes energy immediately available. As we've discussed, the muscles can then also store excess glucose for energy as glycogen.

Remember that muscle glycogen makes up 75 to 85 percent of the glycogen stored in the body. The rest, as we have discussed, is stored in the liver. Unlike the liver, muscle does not release glucose into the bloodstream from glycogen stores. Glycogen in muscle sits, waiting for the organ to need it. When it is needed, it provides the energy to achieve muscle contraction.

Insulin resistance, along with the associated inability of organs to take up more glucose, is a major reason for high blood glucose, weight gain, and difficulty losing weight. So lowering insulin resistance helps with controlling blood glucose, increasing fatty acid use, and weight loss. But organs stop responding to insulin as much if your insulin level is high all the time. That's

the result of persistent high-carb intake. This is the insulin resistance model we have talked plenty about.



*Insulin activates insulin receptors on tissue cells. The receptors, in turn, open up glucose channels to allow glucose to flow into cells to be used as a source of energy. This energy allows for organ function. For example, the energy created in muscle cells fuels muscle contraction.*

Let me draw an analogy. If you go to a rock concert, it seems loud at first. But by the time the second act starts, your ears have gotten used to the high volume. Insulin receptors are like your ears, and insulin is the music volume. The insulin receptors on your muscles become desensitized over time to the increased volume of insulin in the blood, so they don't respond as they should. It takes more and more insulin to affect the muscle receptors, so both blood insulin levels and blood glucose rise.

This analogy comes from an excellent book on the physiology of reducing insulin resistance with strength training. The title is *Fighting Insulin Resistance with Strength Training* and it is authored by William Shang, MD, a pathologist in upstate New York. This is a very informative book and an easy read, I suggest it to anyone who wants to gain a more in-depth understanding of why strength training specifically (and more favorably than cardiovascular training) helps reverse insulin resistance.

## **INSULIN LEVELS, INSULIN RESISTANCE, AND THE REVERSAL OF PREDIABETES**

We've long established that insulin resistance can begin years before average and fasting blood sugar starts to rise.

Fasting blood glucose greater than 100 and/or a hemoglobin A1C level greater than 5.6 percent indicates prediabetes. But neither fasting blood glucose nor A1C become abnormal until insulin resistance has been present for a long time. This is because in the beginning stages of insulin resistance, the pancreas is working overtime to pump out extra insulin to compensate and keep these numbers lower.

This is why the most important test I order when evaluating new patients is a fasting insulin level. Patients' fasting blood sugar and even A1C levels may be normal, but if fasting insulin is elevated, it means the journey to insulin resistance, prediabetes, and perhaps even diabetes has already begun. And we can fine-tune this assessment with a simultaneous blood-glucose level. We use these numbers in the calculation of the HOMA-IR, which we have previously discussed. The HOMA-IR gives us a precise level of insulin resistance. I calculate this number for every one of my patients.

If you have some insulin resistance, even before you are prediabetic, you are not in the first inning but more like the bottom of the third. And the game can end with permanent, irreversible diabetes requiring lifelong medication. Some researchers have suggested that patients have up to six years to reverse insulin resistance before they even arrive at a blood glucose or an A1C in the prediabetic range. The further insulin resistance has progressed, the more difficult it is to reverse. Increasing muscle mass can be another important weapon in the battle to reverse insulin resistance and avoid prediabetes.

Because muscle mass is a key variable in insulin resistance, measuring muscle mass and body fat can be very helpful. Let's discuss a few ways of obtaining these metrics. I arrange to have this testing done for the majority of my patients.



## **BODY MASS INDEX, LEAN BODY MASS, AND BODY FAT PERCENTAGE: THE INSULIN RESISTANCE CONNECTION**

Body-mass index (BMI) is a value derived from a table based on height and weight. BMI is used to classify a person as underweight, normal weight, overweight, or obese. A BMI of under 18.5 kg/m is considered underweight. Normal weight is a BMI of 18.5 to 25. Overweight is 25 to 30, and obese is over 30.

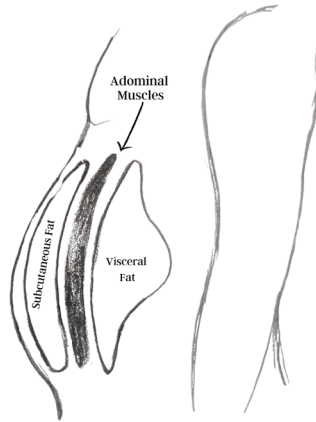
Though BMI can be useful, it does have its flaws. One flaw is that people with high muscle mass (think wrestlers, football players, and weightlifters) may be perfectly metabolically healthy but still have high BMIs. This is because of their relative increased muscle mass, not necessarily because they have a high level of body fat.

It's more helpful to look at two other parameters. The first is lean body mass, and the second is body fat percentage. It is the latter that is usually followed most closely for people attempting to lose weight.

However, just to describe the lean body mass parameter, it is the weight of your body minus the weight of your fat. This difference between total body weight and body fat weight defines lean body mass—the mass of your body (in pounds) that is not fat. This number in pounds is then usually converted to a percentage of your total weight; 70 to 90 percent lean body mass is considered healthy. Men tend toward the higher end of this range while women tend toward the lower number.

When considering the amount of fat a person carries, body fat percentage is a more commonly referenced parameter than body fat weight. This is a measure of the percentage of your body weight consisting of only your fat. This is a number I follow periodically—say, every six months—in many of my patients. This percentage varies between men and women since women carry more fat just under their skin. This fat directly under the skin is called subcutaneous fat and is different from the visceral fat around the middle that we have previously discussed. Women have this extra fat as an additional protective store of energy as the sex with the responsibility of carrying offspring. Body fat percentage in males normally varies from 3 percent in high-performance athletes to over 25 percent (sometimes much over 25 percent) in obese individuals. Female body fat percentage

ranges from 14 percent in lean athletes to over 32 percent, which is again considered obese. In both sexes, body fat in obese individuals can exceed 50 percent. Plenty of patients who come to me looking for help for weight loss initially have body fat percentages in the 40s and even low 50s.



*Visceral fat is the fat stored within the abdominal cavity. Truncal subcutaneous fat is located under the skin surface but outside the abdominal cavity.*

Body fat percentage can be assessed in many ways. The most common is the bioimpedance method utilized by commonly available scales. With this method, a very small electrical charge is sent through the body, and the body fat determination is made by how much that current is impeded by fatty tissue. I see a lot of variability from scale to scale in the same person, suggesting accuracy is sometimes lacking. (Though these scales can provide “reproducible” results—see below.) So, home bioimpedance scales by themselves are not the preferred method of body fat evaluation. However, there are very expensive commercial impedance machines like the “Inbody 570” that do provide accurate numbers. These are sometimes found in large health clubs and hospitals. Other optimal methods for this evaluation include water tank displacement, whole-body air displacement (BodPod), and specialized DEXA scan machines that use low-radiation X-rays.



*An “Inbody” device uses bioimpedance (electrical currents) to accurately determine lean body mass and body fat percentage. A “BodPod” does the same using air displacement technology.*

I mentioned that the home bioimpedance scales, though not exceptionally accurate, do generate very reproducible numbers. I often will arrange for my patients to obtain a reading at a local site providing one of the more accurate methods of assessment. They are asked to bring their home bioimpedance scale with them to the assessment. The patient then steps on their home scale immediately after their testing. If we learn the home scale is off—say, by three percentage points of body fat—we just use that adjustment factor on an ongoing basis (i.e., add or subtract three percentage points, as appropriate). This allows the convenience of ongoing scale use at home and, with the adjustment factor, relatively accurate reproducible numbers.

Body fat percentage can help guide a CGM diet better than BMI. It is another approach to reinforcing the progress a person is making. This helps provide objective data at a more granular (body composition) level, in comparison to looking at only weight milestones. Seeing improvement in your body fat percentage can be a great motivator. I recently had a male patient who dropped his body fat percentage from 36 percent to 28 percent, with an intent to lose another fifteen pounds beyond the thirty-five he had already lost. The body fat percentage he was seeking (25 percent) was a big motivating goal for him.

Back to strength training. I have nearly all our patients pursue strength training. Even for those with limited mobility, they can stand or sit to perform strength-training workouts. Be aware that muscle weighs more than fat; if a patient is putting on muscle while decreasing visceral fat, the weight on the scale may not change as quickly. But clothes will fit a lot better, and patients look and feel better, even though the scale may not reflect the extent of the transformation taking place. Following body fat percentage reaffirms what the patient sees in the mirror.

### **How Skeletal Muscle Can Help Reverse Insulin Resistance**

Skeletal muscle quantity and quality affects how insulin resistance progresses. As a person gradually puts on unhealthy weight, usually a suboptimal amount of skeletal muscle contributes to this process. Excessive carbohydrate intake of course plays a major role as the amount of truncal fat expands, and body fat percentage goes up. But the role of skeletal muscle is important since it stores more glucose from each meal than any other body system. (Fat does not store any significant amount of glycogen.) More muscle means more glucose is absorbed and stored as glycogen in that muscle, and less is left in the bloodstream to eventually be converted to fat by the liver.

In America, muscle disuse is a widespread problem. Most people in developed countries suffer from a lack of regular muscle use. This issue is much worse in the US today than it was even fifty years ago. We do less physical work and even less walking than we did as an agrarian or early industrial society. Our muscles are not stressed like they once were, so they can't respond to stress with growth. There have been many benefits of the information age, but a favorable effect on muscle mass is not one of them.

People with more muscle mass, very simply, soak up more glucose. This allows these individuals to ingest a higher carbohydrate load before their blood sugar rises significantly, in comparison to those with less muscle mass. A higher muscle mass allows for a quicker transition to the use of fatty acids for energy. I have found that as a patient of mine increases their muscle mass, blood-glucose control is much easier. CGMs make this data easily trackable. Remember the patient I mentioned above who dropped his body fat percentage? As he put on muscle with a strength-training program, his CGM curves improved. This was despite the fact that he increased his daily carb allotment during this time from 35 to 50 grams per day.

Resistance exercise (strength training) increases muscle size. A large, active muscle mass can demand as much as 85 percent of the body's circulating glucose. And if only limited amounts of blood glucose or muscle glycogen is readily available, these larger muscles will seek fatty acids for energy. So we increase muscular absorption of glucose and burn more fat by growing our muscles larger with resistance training.

This information should guide the amount and type of exercise you do. Aerobic exercise, which increases heart rate, is necessary for optimal health. However, many studies have shown that the combination of dieting and aerobic exercise alone does not meaningfully impede the progression of insulin resistance.

I recommend resistance training be given priority as part of my patients' workouts. For example, if you are doing a workout session that is a combination of cardio and strength training, do the strength training first. This allows you to put maximum effort into building muscle before you are partially fatigued. The cardiovascular training can be done second, even if you are a little more tired. You can still get your heart rate to a desired level in this workout session order and get the full benefit of your cardiovascular training effort. This is the optimal workout sequence to help build muscle mass so those muscles can soak up insulin, glucose, and also use more fatty acids for energy. The result is reduced insulin resistance and reduced weight. And you are still getting your cardio in.

Sarcopenia (reduced muscle mass) results from the loss of muscle mass with a sedentary lifestyle and aging. After age thirty, we lose 5 to 7 percent of our muscle mass per decade. Those with sedentary lifestyles can lose 50 percent of muscle mass in a lifetime. These individuals then have less muscle to soak up insulin and glucose. This is why, I believe, strength training becomes even more critical as we age.

## **BASAL METABOLIC RATE AND WHY IT MATTERS**

Basal metabolic rate (BMR) is the rate at which energy is used by our bodies when we are at rest—for example, when we are at a desk, watching TV, or sleeping. It is the energy needed to keep basic vital functions like pumping

blood, breathing, keeping warm, thinking or dreaming, and digestive processes operating.

Increased muscle mass leads to a higher BMR. What this means is that if you can increase the size of your muscles, you will burn more energy at rest. With increased muscle mass, calorie expenditure is greater. We have talked throughout this book about my firm belief that diets based on calorie restriction are not preferable or sustainable. Weight loss is not strictly an energy balance issue (calories in less than calories out equal weight loss). This being said, if you can increase muscle mass and burn more energy—for example, fatty acids when blood glucose is controlled—it can be supportive of weight loss. With an investment in developing a larger muscle mass with strength training, you burn more energy at rest.

Related to energy balance, then, strength training offers a double benefit. You burn energy while you are working out to increase muscle mass and later on when you are at rest. Cardiovascular fitness exercises offer the former benefit, but not as much of the latter.

### **CGM Program Compatible Cardiovascular Training Recommendations**

Life is busy, so the time available for working out is always limited. With this reality in mind, I help our patients structure their physical activity so they can achieve adequate cardiovascular (aerobic) training while making building muscle mass a priority. (I will use the terms *cardiovascular training* and *aerobic training* interchangeably.) Cardiovascular training is important and can't be neglected as heart and vascular health can't be ignored, but building muscle mass is critical to helping lower insulin resistance and achieve weight loss.

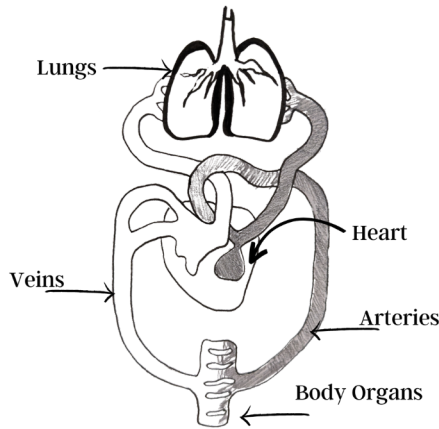
I request that our patients devote at least an hour and fifteen minutes each week to aerobic training. This is focused on getting the heart rate up into a beneficial range and keeping it there for a specified period of time. If a patient is already doing strength and cardiovascular training (e.g., running or a cardio machine), I ask them to continue the regimen they have been on in the first weeks of working with me. I will then also be asking them to start following our minimum guidelines for strength training within about a month. If they weren't working out before, we do not ask them to start an exercise program until they have adjusted to their lower-carb lifestyle. This

usually takes at least a couple of weeks. Sometimes, if extensive education on diet is necessary, we might delay this up to six weeks. This approach reflects the primary importance of diet modification early on. I want them to make sure they understand the dietary portion of the Metabolic MD program first and are meeting their low-carb target goals. We emphasize during this phase that it is also important that protein intake is adequate, usually 100 to 125 grams per day.

When they are ready to begin the exercise portion of the regimen (if not previously working out), we ask our patients to follow the aerobic and resistance structure we provide. I say “we” because not only do I provide patients guidance in this regard, but the personal trainers on my staff also provide them instruction by phone, telemedicine link, or in the gym weekly. Our coaches are advising them regarding a structured workout to assist them in meeting both cardiovascular and strength-training goals.

The extent of guidance, advice, and instruction is dependent on the patient’s background. Some patients come to me with an extensive workout and strength-training background. Some have never lifted a weight in their life. We customize the approach to the patient’s situation, providing extensive help to those who need it but not providing redundant instruction to those who already have a good knowledge base in this area.

Let’s now talk about a foundational amount of aerobic training. Working the heart and cardiovascular system as the American Heart Association (AHA) recommends is essential to overall good health and well-being. However, we believe in the context of preserving time each week for strength training, aerobic exercise should be limited unless you are training for an aerobic sports competition, such as a marathon, triathlon, or recreational sports league you are involved in.



*The goal of aerobic training is to maintain and enhance the health of the heart and blood vessel system. It also enhances the exchange of oxygen from the lung tissue into the blood.*

If you have unlimited or even extra workout time, you can, of course, spend more time on aerobic effort. But who has that? The point is that strength-training time and effort should not be curtailed.

The AHA recommends:

- Moderate exercise intensity: 50 to 70 percent of your maximum heart rate for 150 minutes per week, or
- Vigorous exercise intensity: 70 to 85 percent of your maximum heart rate for 75 minutes per week.

Maximum heart rate is defined as 220 minus age. So, for a fifty-year-old, the maximum heart rate is 170. The range of 70 percent to 85 percent of heart rate maximum—the vigorous exercise level—would be about 120 to 145 beats per minute. I prefer about 80 percent, and I request that my patients target that range.

I believe the best approach to cardiovascular exercise is a vigorous exercise level for three twenty-five-minute sessions per week, totaling seventy-five minutes. A couple of thirty-eight minute sessions are also acceptable. Alternatively, at the moderate intensity level (first level), a good approach would be three fifty-minute sessions. I think the 50 percent target is a little low, so if my patients are exercising at a moderate intensity level, I ask them to get to at least 60 to 65 percent of their heart rate max. The eventual target



in this lower range will be the max at this level, or 70 percent. For a fifty year old, seventy percent of maximum is a heart rate of about 110.

The seventy-five-minute vigorous intensity regimen leaves more time for the four hours of strength training I recommend. (See below.) It is important that you leave adequate time in your workout regimen to build muscle mass to address the insulin resistance that is typical of most overweight adults. So being able to devote just 75 minutes a week to cardiovascular training because a vigorous level of training is achieved is the best option.

Note that the clock does not start for either of these regimens until the heart rate is at the target number. Warm-up time does not count.

A word about CGM curves during vigorous exercise. Exercise can result in the release of adrenaline by the adrenal glands. Adrenaline then increases circulating blood glucose by causing the breakdown of glycogen. So, even if no food is ingested, an increase in blood glucose can be reflected by the CGM during exercise. I receive questions from some of my patients regarding why their blood sugar is going up during exercise even though they are not eating. Release of adrenalin is the reason.

We recommend that patients with any history of a cardiovascular issue consult their primary care physician or cardiologist before beginning an exercise program. For patients who have not previously pursued cardiovascular fitness, we recommend starting with frequent walks at the lower heart rate threshold of 60 to 65 percent of maximum, then gradually increasing the pace until the heart rate reaches the 70 percent goal. At this level 150 minutes a week is a good target. If patients do well, they can then aim for the optimal 80 percent heart rate level for only 75 minutes per week.

Running, biking, or using cardiovascular machines (stationary bikes, ellipticals, stair steppers, or any similar type of machine) are all good training options.

Apple watches, Fitbits, and similar devices can be used to provide accurate heart rate readings. The heart rate devices built into some machines allow an assessment of heart rate as well. However, I like to use a simple finger pulse oximeter. Pulse oximeters are the devices that can be put on a fingertip to assess both heart rate and oxygen saturation. They are commonly used in medical settings. I like these devices because you can see your actual

pulse waveform and therefore be certain you are getting an accurate reading. You can find one on Amazon or at Walmart for about fifteen dollars. You needn't measure your pulse constantly, but you should check it often enough to ensure you are staying in your target range.

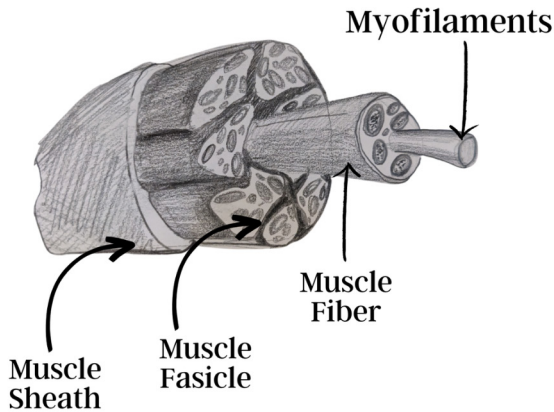
## **CGM PROGRAM COMPATIBLE RESISTANCE TRAINING RECOMMENDATIONS**

The terms *resistance training* and *strength training* are interchangeable. I recommend that my patients who haven't lifted weights previously start with lighter weights and work with a knowledgeable partner such as a friend or family member or, if needed, a personal trainer. Once they understand the proper techniques, they can start training alone. Most of my patients use free weights or machines, but other resistance techniques are acceptable. Effective strength-training techniques go beyond just lifting weights. Other resistance training techniques can achieve a similar result. Bands, Pilates, and body weight training like push-ups and pull-ups are all acceptable. I do like my patients to work in some training involving free weights or machines eventually if they choose to start with one of the other techniques.

The importance of proper technique and an appropriate amount of resistance cannot be overstated. Injury can set a training program back months, and a top priority for those who are not familiar with resistance training is avoiding injury while they are learning proper technique. Even with the correct techniques, injury risk exists, so start with a low level of resistance, then work your way up. If you are not versed in strength-training techniques, make sure you obtain appropriate instruction.

### **Why Fatigue Is Good**

Taking a muscle group to exhaustion is necessary to obtain the maximum benefit from resistance training. With muscle exhaustion comes muscle enlargement and increased blood flow in the muscle that allows insulin, fatty acids, and glucose to be captured. Also, the mitochondria in the muscle—the component of the muscle cells that uses fuel to create energy—multiply when stressed by strength training. This is one of the reasons BMR improves with increased muscle mass.



*Muscles consist of groups of myofilaments bundled into muscle fibers. The fibers are in turn bundled into fascicles which are then contained within muscle sheath.*

Resistance training damages muscle fibers. After a day of recovery, those fibers respond by getting larger. While you must be careful to avoid risking injury if you're new to strength training, pushing to exhaustion is important as you gain familiarity with your workout. There is a little bit of truth to the phrase "If it does not kill you, it will make you stronger" as muscles only grow when they are physiologically stressed. The fibers are not killed, but they are stressed and respond to that stress by enlarging.

Getting the maximum benefit from your lift requires using the correct amount of resistance. To determine the correct resistance, you must consider the number of repetitions of a given exercise you are going to do. A repetition is one complete motion of an exercise. For example, if you are bench pressing, this is the act of lowering the bar onto your chest and then returning it (pushing it back up to the original position). Doing this once is one rep. Doing it five times in a row is five reps.

For best results regarding achieving muscle mass increase, it is generally recommended to stay in the eight-to-twelve-rep range for your ongoing workouts. However, when commencing a new workout regimen, for safety and injury-avoidance reasons, you should start with lower weights and a higher number of reps. Up to fifteen reps may be appropriate for the first two or three workouts, until you are comfortable increasing the amount of

weight and lowering the number of reps. Generally, fewer reps and higher weight build muscle mass most effectively.

But how do you know how much weight to use for each exercise as you begin your regimen? One way is to estimate your one-rep max—that is, the amount you can lift for one repetition. You can estimate your one-rep max with a variety of formulas, including the Brzycki, O'Connor, and Epley formulas. You can find calculators for these formulas on the internet. They estimate the largest weight you might be able to lift for one rep. You can then usually use 60 to 70 percent of this amount for your ongoing workouts. Start a little lower if you are just commencing a lifting program for the first time. Staying healthy and avoiding injury are key. A good approach (after a few initial workouts targeting fifteen reps) is then very gradually increasing weight over time, based on your success in the eight-to-twelve-rep range.

A set is how many times you perform a given number of exercise reps. So doing ten bicep curls three different times is three sets.

A typical workout consists of twenty to thirty sets exercising different muscle groups. People new to strength training may want to start at just ten to fifteen sets. Muscle groups include the chest, biceps, triceps, shoulders, back, and legs. We recommend throwing in a few sets of “core” exercises like planks, sit-ups, and roman chairs. (The core of the body is the area between the pelvic floor and the diaphragm.) Each workout’s routine need not be exactly the same, but I suggest you work a given muscle group at least twice a week. (See strength-training schedule options below.)

It is important to work hard enough that you experience some mild soreness in your muscles the day after your workout. This is a good gauge of the likelihood of progress—that is, muscle mass growth. Remember, muscles only get bigger when they are first slightly damaged from stress. Mild soreness is an indication of adequate stress.

There are many, many different strength-training routines. Below, I suggest a starting point for those who are new to strength training. If you are not well versed regarding strength-training workouts, talk with others who are. Starting with a knowledgeable partner or engaging a personal trainer for a few initial sessions is a good idea.

## Strength Training Schedule Options

Give muscles at least twenty-four to thirty-six hours of rest after a workout. Muscle groups need this time to recover and grow. A convenient way to do this is with a whole-body workout, which can be done three to four times a week, every other day. Most of my less-experienced patients start with a whole-body workout. They may then, with increased familiarity with strength training, move on to more focused muscle group workouts.

Alternatively, as alluded to, another workout protocol is to divide workouts into leg and core day, back and bicep day (pull day), and chest and triceps day (push day). This allows for consecutive-day workouts as you are always working a different body part on consecutive days. You are giving the muscle group worked yesterday a break today.

There are other workout schedules. The variations as to how to structure your workouts are almost limitless, but the intent should be to work a muscle group about two to three times per week and no more often than every other day.

Devoting seventy-five minutes a day, four days a week comprehensively (aerobic plus strength) to your workouts should be enough. That's five hours a week, which is reasonable if you're serious about weight loss and improving your health. If your aerobic activity is at a vigorous level (seventy-five minutes per week), that leaves you nearly four hours a week for strength training. This allows you plenty of time to get in at least twenty sets three or four times a week.

Don't get hung up on these workout time goals. Any serious attempt at physical activity is beneficial. Anything, even just a few times a week, is better than nothing. The important thing is to get started and to include some strength training in your routine. Don't beat yourself up if you can only get in three or four hours total workout time a week. Incremental progress is OK. I understand it takes time to get to the gym, get dressed, and take a shower afterward. But on the flip side, many of our patients who have not worked out in the past really get into their new routine. And some of those who worked out when younger rekindle their love of physical activity. Both groups get a lot of satisfaction from their newfound avocation and progress.

### *The Larger Muscle Groups (And What to Know about Them)*

The largest muscle groups of the body are the axial muscles—the muscles that are part of the core structure and just above and below the core. These include the upper legs, back, and chest. Working with these groups gives you the best results when strength training since, because of their relatively bigger size. Enlargement of these muscle groups in particular substantially increases the body's ability to soak up insulin, glucose, and fatty acids. If short on workout time, I ask my patients to focus on the back, chest, and core/legs.

Leg workouts are crucial since the area from the waist to the knees contains nearly 50 percent of the body's muscle mass, and keeping your legs strong will also help you stay physically mobile as you age. Typical leg exercises include squats, deadlifts, lunges, leg extensions, and leg curls.

Sometimes because of poor leg strength, patients can't start leg exercises with added weight. And that's fine. They start by doing a squat while holding no weight and standing up from a sitting position using only the legs, not the hands or the arms. They might do ten reps just sitting and standing. Leg exercises lend themselves to body-weight resistance. Many of my patients start leg workouts with body-weight resistance only, then progress by adding weight, such as holding a light dumbbell in each hand.

## **FINAL THOUGHTS ON STRENGTH TRAINING**

In the discussion above, I talked mostly about a strength-training plan using free weights or weight machines. However, as mentioned, any type of resistance is appropriate: body weight, bands, Pilates, et cetera. For example, only body weight is used with such exercises as push-ups, pull-ups, planks, and many others. Some of my patients start with body-weight exercises and resistance bands, and then maybe add a few lightweight dumbbells into their routine. You do not need a lot of expensive equipment, and you do not need to have a gym membership. Good resistance workouts can be completed at home with minimal equipment. Also, so as to not miss work outs, many of my patients take a set of bands with them when traveling for work or when on vacation.

I work to assuage the fears of my female patients about developing a bulky appearance. This should not be a concern for the vast majority of women who want and need to lose weight. I have not had a single woman in my many years of metabolic-health practice voice concern that they are looking or feeling bulky because of resistance training. On the contrary, most who get into a routine are pleasantly surprised with how their body tone improves and how their clothes are fitting better. I had one patient, who had never weight-lifted before, express being thrilled with, as she put it, her “transformation.” After just four months of training, she came to an appointment telling me that a few days earlier, she was brushing her hair in the mirror and, for the first time in her life, recognized she had bicep muscles. She now calls these her “guns,” which is a slang term for well-developed muscles of the upper arm.

In the last three chapters, we discussed key concepts of achieving weight loss and improved metabolic health: the low-carb diet, intermittent fasting, and strength training. The vast majority of my program-compliant patients reach their weight loss and health goals with this regimen. But I do have some patients who stall a bit before they reach their goals and also a minority who want more help in getting off to a running start with their weight loss.

There is one more tool that can be utilized in these cases, and that is the new FDA-approved weight-loss medication semaglutide.





## CHAPTER 9



# SEMAGLUTIDE (WEGOVY)—THE NEW FDA-APPROVED WEIGHT LOSS MEDICATION

**A**t Metabolic MD, for many years, we have helped patients achieve sustainable weight loss and health success using the proven tools we have talked about up to this point:

- A CGM-guided low-carb diet
- Intermittent fasting
- Strength training

With this approach, nearly 100 percent of patients achieve sustainable weight loss, with patients not infrequently losing twenty-five pounds, thirty-five pounds, and more. They also reverse disease and lower medication requirements. And they learn habits that last a lifetime. Habits that will support continued health into old age. My patients' results are a testament to the effectiveness of lifestyle changes as a way to reverse chronic conditions stemming from high blood glucose and associated excess weight.

But once in a while, I have a patient get stalled. They need some more help. Or once in a while, when a patient reaches their initial goal of, say, losing thirty-five pounds, they want to go further.

Occasionally, a new patient wants to get a running start with their weight loss. In just the last several years, an additional tool has become

available to help these patients. That tool is the new FDA-approved weight-loss medication semaglutide (and medicines similar to it called GLP-1 agonists). Semaglutide is marketed under the brand name Wegovy and has been prescribed for several years to diabetics for blood-glucose control as Ozempic. All three of these names refer to the same medicine.

There are three very important caveats when considering using one of these medications. The first is that semaglutide should only be used as part of a structured diet and exercise program under the guidance of a qualified medical professional. It's not a wonder drug or magic pill that will ease your metabolic health and excess weight worries for good. You cannot just take an injection once a week and expect lifelong weight-loss results. Semaglutide requires you to apply yourself. It should always be utilized as part of a program that includes appropriate dietary modification and exercise. I often do not begin this medicine for a new patient until they have shown they can implement these lifestyle changes successfully.

The second is that when you use this medication, the weight loss that occurs is not just the result of reducing fat. Muscle is lost as well. This is a problem regarding both the issue of muscle mass's relationship to insulin resistance and the need for all of us to preserve muscle mass as we age. More on this later.

The third caveat relates to the first, and it is that weight regain almost always occurs if this medicine is stopped. So, unless a person plans on being on this expensive medication for the rest of their life, the diet and lifestyle changes we have discussed in previous chapters are essential to long-term weight management control. If lifestyle changes occur, this can be an effective medicine to work through a stall or to jump-start success. Without the changes we have discussed throughout this book, however, good health will not be sustainable. I have found over and over again that if these lifestyle changes (a low-carb diet, fasting, and regular workouts) are in place, the risk of significant weight regain and recurrence of metabolic disease is minimized when the medicine is withdrawn.

## A PHARMACOLOGICAL WEIGHT-LOSS INNOVATION: THE GLP-1 AGONISTS (OZEMPIC, WEGOVY, SEMAGLUTIDE, MOUNJARO)

Semaglutide is an FDA-approved medication for both diabetics (Ozempic) and nondiabetics (Wegovy). It is a once-weekly injectable medication that is given as a minimal dose to start, then increased bit by bit weekly until a therapeutic dose is reached. The injections are done by patients themselves at home, similar to the way diabetics give themselves insulin. These injections are given either via prefilled pens, or with insulin syringes and a vial of medicine. For many years, this medicine has been used effectively to lower blood sugar in diabetics under the brand name Ozempic.



*Ozempic is a GLP-1 agonist that is FDA approved for the treatment of Type II diabetes. Wegovy is the same medication, approved by the FDA for weight loss. Both are manufactured by Novo Nordisk and are administered using a prefilled pen as a once-weekly injection.*

This medication has many favorable characteristics. One is that it lowers blood glucose but does not cause hypoglycemia. When the company making this medication realized it helped achieve weight loss without causing hypoglycemia, it sought approval for the medication as a treatment for obesity in nondiabetics. In 2021, semaglutide was approved for weight loss in nondiabetics and, under the brand name Wegovy, has been available for the treatment of overweight or obese patients as a once-weekly injectable since that time. To clarify, semaglutide is the generic name for both Wegovy

and Ozempic. All three are the same medication: Ozempic is marketed to diabetics, and Wegovy is marketed for weight loss. The generic medicine has up to this time been available in a compounded form through medical providers who work with licensed compounding pharmacies. Users of the compounded form, however, need to be aware that due to potential patent considerations and evolving state pharmacy board rules, the availability of the compounded form can not be guaranteed indefinitely going forward.

Other medicines in this class of medications (the GLP-1 agonists) will also soon be approved for weight loss. This will include tirzepatide (generic name), which is now used to treat diabetics under the brand name Mounjaro. Tirzepatide has been found to be equally if not more effective for weight loss than semaglutide. Trulicity and Saxenda, commonly prescribed to diabetics, are also GLP-1 medications. In my subsequent comments on these medications, I will refer to only semaglutide, but the information applies, in general, to all the GLP-1 agonists.

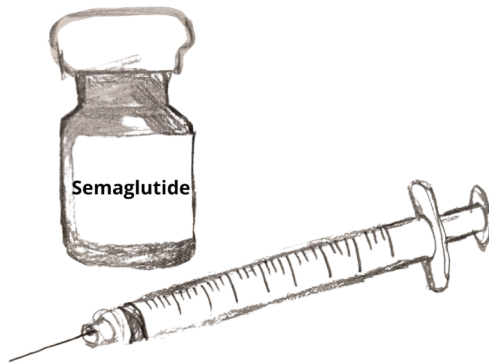
We'll discuss access to these medications and associated cost issues below. Semaglutide is available currently as a compounded generic. It is compounded with Vitamin B12 to decrease the nausea this medication may cause. As a compounded generic, it has been available at a lower cost than the brand-name medication. However, compounded semaglutide is not FDA approved and, therefore, is prescribed as an off-label medication. Additionally, most state pharmacy boards have allowed medical practices to provide this medicine as a generic due to medication shortages and supply chain issues associated with Covid. It is uncertain, as the supply of brand name Wygovy becomes more available, if this will continue. Anyone starting this medication in the generic form should be aware that availability of this generic may be curtailed by state pharmacy boards in the future. Metabolic MD has relationships with licensed compounding pharmacies and prescribes compounded generic semaglutide. We will continue to do so unless prohibited from this prescribing practice by state pharmacy boards.

### **How to Take Semaglutide**

Semaglutide is taken once a week as a subcutaneous injection in escalating doses. This means that you start the medication with a low dose and then increase the dose over time. Usually, the same dose is taken as a once-weekly injection for four weeks and then the dose is increased and the process

repeated for another four weeks. This cycle is repeated about five times over five months. By the time the final dose (the ceiling dose) is prescribed, the amount of medication injected is more than ten times the initial dose. This slow and measured increase in dosing is necessary to avoid significant side effects. (See below.)

If the brand-name medicine Wegovy is being used, it is provided as an injectable pen in which the correct dose is selected by dialing the required number of “clicks.” Ozempic is administered in the same manner. If provided as a compounded generic, no pen is provided. The injection must be self-administered with a very small needle, much like an insulin injection. The correct amount of medicine must be drawn up into the syringe by the user from a small vial of medicine. While the injections are not 100 percent painless, they cause very minimal discomfort.



*Compounded semaglutide is a combination of generic semaglutide and vitamin B12. It must be administered by drawing the medicine into an insulin syringe and then injecting this fluid into the subcutaneous tissue just below the skin, usually in the abdominal area.*

In lower doses, hunger may not be significantly suppressed. For a significant percentage of patients, the first dosing amount is often “subtherapeutic”. However, these lower doses are necessary to allow the body to acclimate the medicine and avoid potential side effects (primarily nausea and constipation). Tolerance to these side effects builds as the dosage is slowly increased. Most of my patients experience mild nausea for the first

couple of days after a dosage increase. This may again occur during the second dose at the same strength. By the third and fourth weeks of that dose, there are usually no symptoms. However, the next time the dose is increased, this pattern may occur again. Nausea medicine can be prescribed as needed. When my patients reach the highest dose, after an injection or two, they are fully accommodated to the medicine and usually have no further side effects.

Some individual variation in the dose is possible and sometimes necessary. This is the advantage of working with a clinician experienced with this medication. Individual responses vary. For example, if a patient has no side effects at the lowest doses when starting the medicine, they may be able to move the dose up after just a couple of injections at that dose, instead of four. Alternatively, if a patient has some mild, persistent nausea after the fourth injection at a given dose, it may be a good idea to continue that amount for a few more injections to avoid the nausea that may accompany a higher dose. I even decrease doses—that is, go back to the previous dose—if needed for a patient who is having excessive side effects as the dose is moved up. This individualized approach allows us to maximize the medication's benefit while keeping side effects to a minimum.

Finally, regarding dose titration, avoiding maximal allowable dosing should be a consideration. I maintain my patients at low or moderate doses (not high doses) whenever possible. Obviously, I increase dosages to an effective level as needed to achieve weight loss. However, I begin with the end in mind, meaning that for most patients the plan is to achieve effective weight loss, make lifestyle changes, and then titrate back down off the medicine. A lower “ceiling dose” facilitates titration down off the medicine.

### **How Semaglutide Works**

The term for how a medicine achieves its result is its mechanism of action. Semaglutide has three mechanisms of action. First, it slows the emptying of the stomach. It does this by temporarily narrowing the passage between the stomach and the intestines, the pyloric valve. (Remember that this is the same mechanism by which fat increases satiety.) Consequently, you feel fuller longer. The slowing of gastric emptying also allows the stomach to fill up more quickly when you are eating, so you eat less. This mechanism of

action means you are not looking for the next meal in a few hours. Fasting is easier as well.

Secondly, semaglutide acts on the hypothalamus in the brain. This is the brain's hunger and satiety center. The hypothalamus controls our perception of hunger, and semaglutide decreases this hunger by its effect on this area of brain tissue. You may consider this a type of psychological effect of the medicine.

Finally, semaglutide lowers blood glucose and keeps it in a reasonable range without causing hypoglycemia. We have talked throughout this book about how, if blood glucose is lowered, the organs will seek fatty acids as a source of energy. Consequently, by lowering blood glucose, semaglutide encourages the body to burn fatty acids.

### **How Semaglutide May Help You Lose Weight and Improve Health**

While no medication is without risks and side effects, semaglutide is safe for most patients. (We cover reasons the medication may not be appropriate for a patient and a list of potential side effects below.) Before you get a prescription, you need to have a thorough conversation with your medical provider about your medical history. That way you can be confident that semaglutide is safe for you. Important items like the other medications you are taking will need to be reviewed as semaglutide may not be safe if you are currently on certain types of blood thinners, other weight-loss drugs, or other blood glucose-lowering medications. You also will be made aware of potential side effects, the most common being nausea and constipation, though the list of more rare side effects is much longer. Also, the medical provider prescribing this medication, as we have discussed, should be certain you are also involved in a comprehensive diet and exercise program, preferably one with the components I have outlined in this book.

Remember, initially, semaglutide was prescribed only to diabetics. When diabetics used it, they lost an average of 12 to 15 percent of their body weight. In the most widely published medical studies of semaglutide, the average weight loss achieved was about 15 percent of initial body weight. Again, all the studies on this medication were of patients who were also involved in a diet and exercise program. Do not expect exceptional results, or results as good as they could be, without this associated effort. As you can bet, my belief as confirmed by my experience with my patients is that

the best diet is a low-carb diet with some intermittent fasting, and the best exercise regimen includes strength training. Again, don't expect simply to take a shot once a week and lose a bunch of weight.

I have had many patients come to me who attempted the shot-only approach with another provider whose involvement was limited to writing a prescription. It did not work. I call them "Wegovy Failures". Once a comprehensive program is put in place, good weight-loss progress is made almost 100 percent of the time.

Individual weight-loss levels with semaglutide vary based on starting weight, diet, and associated workout effort. In my practice, it is not unusual to see a patient lose 20 percent of their starting body weight during treatment. And while semaglutide will help you lose weight, it won't keep it off indefinitely if you don't get to the root problems that caused the weight gain in the first place. These include insulin resistance, poor eating habits, and a sedentary lifestyle.

All studies on semaglutide have demonstrated that weight regain occurs when the medicine is stopped. So, in other words, these medicines will only be a temporary fix without associated lifestyle changes. This is why in my practice I focus heavily on lifestyle changes that are sustainable after patients have come off the medicine. It is a rare patient who wants to start semaglutide and be on it for life. Nearly all patients who seek the use of this medication want a jump-start on weight loss or to work through a stall period in their weight-loss progress. Or in some cases they have met their initial goal and are now targeting an even lower weight. They do not want to be on a weekly injectable medicine indefinitely. Additionally, it could go without saying that many metabolic-health parameters can't be fixed with semaglutide alone. The other components of the plan are critical.

In addition to the weight-regain issue, there is another caution to seriously consider with this medication. Several recent studies have highlighted the fact that the weight lost with semaglutide consists of not only fat but also muscle. This consideration underscores the need for a weight-loss program that includes both weight training and increased protein intake (as a low-carb diet does). Weight training with increased protein intake can help preserve muscle that might otherwise be lost if semaglutide is used without these associated metabolic-health improvement efforts. This muscle loss



issue is especially important for older people, who are already at risk for losing muscle mass as they age. It also is of particular interest to middle-aged and older women as preserving muscle mass helps reduce the risk of osteoporosis.

On the upside, semaglutide has also been shown to have long-term health advantages. According to the HCP live network, semaglutide once a week reduces the risk of eventual Type II diabetes in an overweight person by about 60 percent, even before the onset of prediabetes. The article also notes, once again, that these results are only achieved when the medication is combined with diet and exercise. I believe these medicines (the GLP-1s) will likely become one of the most widely prescribed medication classes in the history of the world over the next decade. One reason, as mentioned, is that overweight people who are neither diabetic nor even prediabetic may benefit from the drug.<sup>7</sup>

The landmark study on semaglutide for weight loss was published in 2021 in the *New England Journal of Medicine*. It is worth a read. This article can be easily found online. The study's conclusion: "Semaglutide has been found to only be effective when combined with lifestyle intervention."<sup>8</sup>

### **How Does Semaglutide Affect CGM Data?**

Semaglutide lowers both fasting and after-meal blood sugar. Remember, though this medicine decreases blood glucose, it only very rarely causes low blood sugar. This is why it is safe for nondiabetics to use this medicine for weight loss. The CGM curves I see in my patients on semaglutide demonstrate lower highs and more stable, even curves. There is less variation. Overall numbers are lower, in association with meals, between meals, and during periods of fasting.

Blood glucose declines in the first week after initiating treatment, but in my experience, it may take up to six to eight weeks to reach a steady state of

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7 Kevin Kunzmann, "Semaglutide Significantly Reduces Long-Term Diabetes Risk among Obesity Patients," HCP Live, June 5, 2022, <https://www.hcplive.com/view/semaglutide-long-term-diabetes-risk-obesity-patients>.

8 John P.H. Wilding, DM, Rachel L. Batterham, MB, BS, PhD, Salvatore Calanna, PhD, Melanie Davies, MD, Luc F. Van Gaal, MD, PhD, Ildiko Lingvay, MD, MPH, MSCS, Barbara M. McGowan, MD, PhD, et al., "Once-Weekly Semaglutide in Adults with Overweight or Obesity," *New England Journal of Medicine*, March 18, 2021, <https://www.nejm.org/doi/full/10.1056/NEJMoa2032183>.

lower levels. This would be consistent with the delay that sometimes occurs until dose escalations meet therapeutic levels resulting in weight loss.

Hemoglobin A1C levels decline as well with the use of GLP-1 agonists. This is most marked in diabetics and prediabetics, but even in nondiabetic patients, I see drops in A1C. With my diabetics, I see A1C declines of about one to two percentage points directly related to the medicine. But remember, I usually also see significant drops in A1C utilizing only the low-carb diet and intermittent fasting regimens in my patients not taking semaglutide. I have helped some diabetic patients drop A1C four or even five percentage points (and rarely, even more) before semaglutide is implemented. My impression is that the use of semaglutide is additive to the other interventions relative to lowering A1C numbers.

So, in summary, the use of this medicine results in the CGM patterns you might expect: lower numbers and more stable curves. No hypoglycemia, but fewer spikes and less variability.

### **How Fast Does Semaglutide Work?**

Now, I'm sure you're thinking, *When will I see the benefit of this new and exciting drug?* The short answer is "That depends." As mentioned above, the initial dose is sometimes subtherapeutic. Remember, this medicine must be started at a lower dose to avoid severe side effects. Some patients feel the effects within weeks. For others, it may take up to several months for a good therapeutic effect to be appreciated. The response is individualized. The idea is to introduce the drug to the body in small, tolerable amounts so that any untoward reactions (like nausea) will be very limited if they do occur. And then the dose is titrated up slowly in an attempt to continue to limit side effects in these higher dosage ranges. Again, the first order of business is to do no harm. In my experience, most patients begin to see a result in four to six weeks. It also depends, of course, on diet and exercise regimen. No amount of semaglutide is likely to help you achieve significant and sustainable results if you're not watching your diet and, in my program, watching your carbs.

## Indications, Contraindications, and Side-Effects

There are only two qualifications for treatment with semaglutide for weight loss. These are the “indications” for the medicine:

1. A body-mass index (BMI) of over 30 (obese range), even if there are no other weight-related complications or other conditions, or
2. A BMI over 27 *and* the presence of at least one metabolic-health issue such as diabetes, hypertension, high cholesterol, obstructive sleep apnea, fatty liver disease, et cetera.

Any medical provider prescribing this medication should be certain their patient meets one of these criteria. I have had patients contact me with BMIs as low as 24 wanting semaglutide because—they “just want to lose another ten pounds.” This medicine should not be prescribed for vanity considerations; patients need to meet the criteria for treatment.

There are several other reasons patients should not be prescribed this medication. These are called “contraindications”, which is a term indicating a person has a condition with which this medicine is not safe to use. The most common contraindications, in my experience, are the following:

- Kidney disease (chronic renal failure)
- Liver failure (typical fatty liver disease is not a contraindication)
- History of recurrent low blood glucose
- Active gallbladder problems (previous gallbladder removal is not an issue)
- Pancreatitis
- Medullary thyroid cancer (patient or family history; other types of thyroid cancer and common types of hypothyroidism are not an issue)
- Multiple endocrine neoplasia or “MEN II” (patient or family history; this is a rare cancer that runs in families)

There are also some other very rare conditions that are contraindications, so the prescribing physician should review that full list with the patient before starting this medication.

Additionally, as briefly mentioned above, there are some medication interactions that can occur if semaglutide and other medicines are taken together. Patients on insulin and any other medications that lower blood glucose (usually medications prescribed for diabetes) are at increased risk of hypoglycemia. Note that metformin (Glucophage) usually does not cause hypoglycemia so this medication is compatible with simultaneous semaglutide use. Semaglutide should also be avoided for people on the blood thinner warfarin (coumadin) or other weight loss medications like Adipex or Qsymia. There are several other less common medications that preclude semaglutide use. Again, before prescribing, a medical provider should review all of these with their patient.

Again, the GLP-1 medications can have side effects. The most common one is nausea, and most patients usually experience nausea to some extent. Sometimes this is mild, sometimes more severe. Antinausea medications can be used as needed. Constipation can also be an issue. I usually treat this with magnesium supplements and Metamucil. I have had an occasional patient with transient exacerbation of gastric reflux (GERD) or crampy abdominal pain. Both of which are usually not severe. The list of other side effects is long, but, in my experience, these other problems are relatively rare.

### **How to Obtain Semaglutide: Insurance Coverage, Cost, and Options**

There have been several issues associated with the availability of semaglutide since it was approved for weight loss in 2021 as Wegovy. The first is related to insurance coverage. (Remember, this is the brand-name semaglutide prescribed for weight loss.) In my experience to date, insurance coverage for this as a weight-loss medication is relatively limited. For example, most Medicaid and Medicare plans do not cover it, and very few private insurance plans provide coverage. This has not surprised me as insurance coverage for obesity treatments is traditionally limited. Why, I do not know as you would think it would be financially beneficial for insurers to head off metabolic disease before it becomes an expensive lifelong problem. I have had a very limited number of patients who have had Wegovy approved for insurance payment. I think approval will become more common in the future, but for now, insurance coverage is very limited. Additionally, even despite this limited coverage, the drug has been in short supply. Factory production

issues and supply chain problems affected the availability of Wegovy very significantly in 2021, 2022, and early 2023. However, as of mid-2023, this appears to be improving.

Because of the lack of availability of Wegovy, some physicians began prescribing Ozempic as a weight-loss drug to patients without diabetes. (Remember, brand-name Ozempic is indicated for diabetes only.) This created shortages of Ozempic, to the point that some diabetics who had been on this medication for years could not find a pharmacy with it in stock. Once insurance companies realized this was occurring, they largely refused coverage for Ozempic unless a patient had a bona fide diagnosis of diabetes, as confirmed by a prior authorization, or PA. A prior authorization is a statement by a physician that the patient does, in fact, meet criteria for the medication's use (in this case, diabetes). That is, the physician testifies to the fact that the patient is diabetic. Sometimes, PAs require a trial treatment of another medication for blood-glucose control (for example, metformin) to see if it is effective before it is determined that Ozempic is needed.

These brand-name medications are very expensive without insurance coverage. Wegovy's out-of-pocket cost for patients with no coverage is around \$1,200 per month. Ozempic is usually over \$1,000 per month. This makes these medications, if not covered by insurance, essentially beyond the realm of possibility for all but the extremely wealthy.

Fortunately, up to now, there is another option for access to this medication. Semaglutide is also available in a generic form if compounded with Vitamin B12. Usually it is available at about a third the out of pocket cost of the brand name medications. This is obviously still expensive, but for some patients who do not have insurance coverage for this medication, this lower out-of-pocket cost allows access.

Remember, compounded semaglutide is provided to patients in a vial. It is not provided in an injection pen like Wegovy and Ozempic. The patient needs to draw up the medicine into the vial and then inject it. And, again, this medication is being used off label as it is not approved by the FDA in a compounded form. This being said, I have not seen or heard of any issues (potency, contamination, etc.) associated with its use.

I am now integrating the use of compounded semaglutide as part of the metabolic health and weight-loss program for a limited number of my

patients. However, as previously addressed, the continued availability of the generic form may be at risk in the future. This is because state pharmacy boards may at some point not allow compounding pharmacies to supply physician offices with this medication. Reasons for this potential change include improved availability of brand name Wegovy and potential drug company patent challenges.

At his time Metabolic MD does provide compounded generic semaglutide to a subset of our patients. We will continue to do so if it remains available. However, we caution patients starting this medication that the ongoing availability of the less expensive compounded form can not be guaranteed indefinitely into the future. If state pharmacy boards at some point restrict availability, patients would at that point have the option to switch to the brand name medicine. Unless they have insurance coverage, however this would almost certainly be at a significantly greater expense. Patients electing to start the generic need to consider this risk. This is yet another reason semaglutide should not be prescribed without a prior emphasis on diet and lifestyle changes. It is one reason I do not prescribe this medicine in isolation. In my practice it is only prescribed to patients who meet the indication criteria and who are actively pursuing a comprehensive metabolic-health and weight-loss program.

## **THE FINAL WORD ON SEMAGLUTIDE**

Over the last half decade I have treated thousands of patients successfully for weight loss without semaglutide. I continue to do so. Not all patients need it. However, it can provide another option for patients who want a jump-start or who experience a little stall in their weight-loss journey. It also can be used for patients who want to reset their weight-loss goal to a lower target after initial success. I have many patients who meet their initial goal of losing twenty-five, thirty, or even forty pounds but still have a BMI meeting criteria for semaglutide treatment. Some want to shoot for a lower ultimate weight and move forward with a second phase of treatment. This subsequent phase is structured to include all previous program components with semaglutide added to help facilitate further progress. This approach can

be the icing on the cake of an already-successful metabolic-health program. (Please excuse the sugary reference!)

Remember, most people do not start this medication with the intent to be on it for a lifetime. So make sure you are putting the other lifestyle changes in place. These are lifestyle changes that will assure your continued metabolic health and maintenance of weight loss after medication discontinuation.

There are a few other critical things to remember if you want to consider using this medication as part of a comprehensive metabolic-health and weight-loss program. They are important enough for me to reiterate them here.

Begin the use of this medicine with the end in mind. Achieve the lifestyle changes during use essential to eventually coming off the medicine successfully, without significant weight regain. Another goal should be to finish the medication course with as much or more muscle mass than when you started. So a program of a low-carb diet with adequate protein intake and strength training is crucial.

It also is very important to work with an experienced medical provider. This is a medication that may need to be titrated up or down, based on side effects and results. You want to be working with a doctor who has experience in this regard to help you avoid becoming sick (nausea mostly) as your dosage is increased.

Be wary of any provider whose primary interest is in just prescribing you medicine. Semaglutide without a program can be a waste of money and time. Remember the Wegovy failures who came to me whom I mentioned earlier? These people were not failures, nor was the medicine, but the process sure was. Once we implement the other important pieces of the puzzle—low-carb diet, CGM, fasting, strength training—nearly all do remarkably well. And they continue these lifestyle habits to maintain their lower weight well after they are off the medication.





## CHAPTER 10



# HOW CONTINUOUS GLUCOSE MONITORING CHANGES LIVES

“I’m having trouble, and I’m worried.”

Lorie was fifty-two years old. She worked in a medical office four days a week. She led a sedentary life working at a desk but was often so tired at the end of the day that she’d go home, eat dinner in front of the TV, and be in bed by 7:00 p.m. Her responsibilities did not stop with work. On Fridays and weekends, when her daughter was at work, she was responsible for caring for her three-year-old grandson. Lorie was struggling physically and mentally. She was waking up in the middle of the night worrying about work issues and also if she was going to be able to continue to have the energy to care for her grandson. Her back and knee pain were beginning to limit her mobility, which made both work and the weekends with her grandson more difficult.

She knew something had to change, but she did not know what to do. From a financial standpoint, she needed to keep working. As a single mom, her daughter needed her help, but Lorie could not see how she was going to physically be able to continue to help raise her grandson for many years to come.

Lorie had undergone a period of gradual weight gain from her thirties to her mid-forties: 175 pounds to 240 pounds. Her current weight was closer to 250.

Also, the genetic deck was stacked against her. She had a family history of diabetes and high cholesterol, as well as cardiovascular problems resulting from those conditions. Her parents and even her brother had recently been diagnosed with vascular complications. She was a pragmatic woman and not given over to delusion; she knew what was going on and that she couldn't repeat the same old things she had done in the past to try to lose weight and improve her health. She had previously tried countless diets and meal plans. This had included liquid diets, mail-order meal plans, prescribed medications, even hormonal treatments. She sometimes lost a little weight for a while but never kept it off. Nearly all her attempts included some form of calorie restriction. Counting calories is an ineffective dieting technique, and Lorie's current condition proved it. She heard about our practice through a friend who had done well with our program. She then researched our approach by going to our website [metabolicmds.com](http://metabolicmds.com), read our Google patient reviews, and contacted us. "I need a new approach and a lot of support," she said.

When Lorie came to me, she had already been diagnosed with prediabetes and high blood pressure. Her cholesterol had been borderline high for years. Her primary care doctor provided her with medication to deal with these issues, but she felt that the medications were just masking the root cause of her problems. Her situation wasn't changing. In fact, it was getting worse. She was starting to have reflux symptoms, and her poor sleep was worsening. Her doctor wanted her to get tested for sleep apnea.

After her initial evaluation with me, when I saw her numbers, I broke the bad news to her: she was already diabetic.

Her initial two-week evaluation showed spikes on her CGM to 230. Her blood-glucose averages were in the 120s. Hemoglobin A1C was at 7.2 percent, confirming her diabetes diagnosis. Her fasting insulin level was high, in the diabetic range. Her HOMA-IR, of course, showed significant insulin resistance. Fortunately, her liver enzymes were normal, suggesting fatty liver disease was not yet a problem. Lorie's cholesterol was around 200

(the high level of normal), her triglycerides slightly high, and her HDL (her good cholesterol) in the low normal range.

When we worked out her diet program, we initially put her on 75 grams of carbs a day as she was a little apprehensive about going lower. When she did well after a few weeks, we then dropped her target to 35 to 50 grams. She adjusted relatively easily to this diet and a fasting schedule of 8:00 p.m. to 10:00 a.m. She got “hooked” (her word) on her CGM as a tool to guide her diet.

As for exercising, we started very simply. We had her walk for thirty minutes, three times a week, but then gradually extended that to an hour. She had never monitored her heart rate, but we gave her a pulse oximeter so she could be certain her heart rate stayed above 65 percent of her maximum during her walks. After six weeks, we introduced strength training, starting with five-pound dumbbell weights and a set of bands. She did her workouts at home. This training began with very light workouts—just a half hour three times a week. But she “loved it” (again, her words) and was soon working out at home for an hour three times per week. My Metabolic MD trainer coached her on workout structure and intensity (weight, reps, sets, etc.). Within a month, she was routinely reaching muscle failure during her strength-training workouts. She felt much more comfortable working out now and joined a gym. Our trainer guided her by helping her set up a free-weight and weight-machine workout to do there.

Initially, when she started our program, she had to fight through her after-work fatigue. But soon her energy level improved. With increased joint movement, both from walking and weight training, her knee and back pain improved.

Over six months, our nutrition coach and our personal trainer continued to work with Lorie on a weekly basis to guide her through her lifestyle change—diet, fasting, workouts. She saw me once a month. During those six months, she made very good progress. She even took the fasting aspect of her plan further by eating only twice a day on most days: a protein shake at 10:00 a.m. and dinner with her family at 6:30 p.m.

How good was her progress? Her initial weight goal was to reach 215 pounds. But she blew past that goal and ended up at 208 pounds after six

months. Even better, we kept her blood-glucose spikes under 140 and her blood-glucose averages in the 90s.

She required no diabetic medication to keep her blood glucose in check. (Lorie did not need semaglutide added to her regimen; she made excellent progress without it.) Her blood pressure came down, and she was able to come completely off her blood pressure medicine. Her GERD symptoms resolved. She slept better, sleep apnea unlikely to be an ongoing problem.

Her efforts sent her diabetes into remission; her hemoglobin A1C level sank to 5.4 percent. She still had some insulin resistance, as measured by a repeat HOMA-IR, but it was much less than when she started her effort. She was not cured of her diabetes, but this likely means she will be able to avoid taking diabetic medications for many years.

Her lipid profile changed in a manner I see typically on this regimen. Her cholesterol stayed about the same at 200. However, her triglycerides, borderline high before, dropped 25 percent. And her HDL improved from the low normal of 43 to a respectable 55.

As her weight came down, her energy levels improved like never before. She told me, “I feel like I’m thirty again.” Now, rather than worrying about having the energy to care for her grandson, she looked forward to her long weekends with him—taking him to the store with her, going to the park. The discomfort in her back and knees went nearly completely away, allowing her to further increase her exercise regimen. She began to do short runs and, at the gym, was using progressively heavier weights in her workouts.

After ten months, Lorie felt she had her health under control. She was able to move on without us, though we always keep the door open for our patients after “graduation.” Now two years after completing our program, she is still doing well. I check in with Lorie every six months, and her new lifestyle has stuck with her. She has kept herself at about 50 grams of carbs per day, has continued to fast, and has stayed with her workouts. She has not regained any weight, and her diabetes is still in remission.

As a physician, seeing a patient like Lorie turn her health around is tremendously satisfying. Knowing that she is worrying less, feeling better, and meeting her obligations provides, for me, a feeling of great accomplishment. She did all the work; I just provided the guidance. But I feel like I helped to make a difference.

Lorie did not feel her new lifestyle was overly restrictive. In her words, “This was easier than I thought it would be.” She very much feels her new habits are a sustainable lifestyle change. Now, she says she doesn’t even think about foods like pastries, pizza or desserts. They are off the table for her mentally. She is thrilled that she has overcome serious health problems putting her at risk for potentially life-changing complications. Her parents and her brother were already having some of the common complications of their metabolic conditions. She believes, and I agree, that she is now on track to avoid those problems. She now has confidence in her ability to care for her grandson and do a good job at work. This has brought her both happiness and a personal sense of accomplishment.

## **THE POWER A CGM PROGRAM**

The details of Lorie’s story are her own, but her life-changing health improvements are not unlike what I see in most of my patients. Once they’ve gone through our CGM program, many have changed their lives forever. In Laurie’s words, “I’ll never look at a basket of bread or a doughnut the same way again.” I routinely have patients lose thirty to forty pounds and have had patients lose up to a hundred pounds. Lower blood glucose, cholesterol, and blood pressure are achieved routinely using a little device that gives instant feedback. Patients know the action they need to take as a result of the CGM, and the vast majority use this data to manage their health habits and attain a successful outcome.

A CGM program provides obvious benefits while being realistic and sustainable and almost invariably results in the changing of eating habits for a lifetime. The positive reinforcement the device provides keeps you on the path to metabolic health, with the likelihood of a backslide minimal. And it all comes from hard data given to you in real time.

## **CGMS MODIFY BEHAVIOR**

Many studies have shown that diabetics using CGMs modify their eating behavior to keep blood sugar in safe ranges from the time they place their first

CGM on their arm. Several recent studies have shown that the majority of diabetics using CGMs with persistently high blood-glucose levels decrease their average blood glucose by 25 to 30 percent. Because the blood-glucose numbers are not as high to start with in my nondiabetics and prediabetics, the changes I see in those patients are usually not quite as dramatic. But these results are still often impressive and universally result in weight loss and significantly improved metabolic health.

Again, many studies have shown improvement in A1C levels with diabetics who use CGMs. Though improved medication regimens to control blood glucose may have contributed to some of this change, it has been shown that reducing carbs in the diet was the major reason for this improvement.

So there is little question that CGMs help diabetics. But CGM use in nondiabetics is, unfortunately, less well studied. A 2018 Stanford University study in this group of patients has recently been published, and more studies are pending.<sup>9</sup> Results of the Stanford study suggest benefits similar to what I am seeing in my practice. I believe many researchers will study the use of these devices in nondiabetics and prediabetics in the future. As I see in my practice with nearly all my patients, CGMs are integral to the future of metabolic-health improvement. The benefit in using this device to provide an in-depth diagnostic assessment and an objective guide for weight loss, in my view, is also undeniable.

My experience is that patients will modify eating behavior within days when wearing a CGM. In fact, when we start patients in our program, we need to tell them not to react to the CGM at first. Remember that our protocol is to ask patients to wear a CGM for a few weeks without dietary modification. We want our patients to see the effect of their normal diet on their blood sugar. And I want good baseline numbers to use as the basis for their treatment plan.

It is routinely very hard for many of my patients to follow this request. When they see the spikes in blood sugar from their normal eating habits, they want to eat better by consuming fewer carbs almost immediately. I let them know that they'll have plenty of time to make those dietary changes

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9 Armitage, Hanae. "Diabetic-level Glucose Spikes Seen in Healthy People." *Stanford Medicine*. July 24, 2018. <https://doi.org/05/01/2023>.

and, for the first few weeks, request them not to change their eating habits. But many, especially those with significant insulin resistance, are calling back within a week, asking to decrease carb intake. A light bulb has gone off. If I have adequate data at that point, I sometimes acquiesce and let them get started on their lifestyle changes.

I see in my patients that dietary changes take place at two levels. The first is the behavioral changes that take place on a daily or even hourly basis. This is the result of both seeing data in real time and looking at a pattern over the last twelve- or twenty-four-hour period.

CGM patients reduce blood glucose and lose weight by following their daily patterns closely. This is especially true in the first several months of CGM use, but this focus continues even after many months of wearing a CGM. Patients use this short-term (hours to a day) review to change their blood-glucose patterns almost immediately. At this level, the changes usually happen without exceptional effort. They see that they must modify their carb intake to achieve success, so they do it.

The second level is based on the result of being able to review longer trend patterns. All CGMs allow the user to review patterns and data in various ways over longer periods of time as well. One of the most effective pattern reviews is called the average glucose pattern, or AGP, which we discussed previously. The AGP is a graph created by collecting CGM blood-glucose patterns over a few weeks, a month, or ninety days. However, the data is presented in a compilation graph as if it happened over twenty-four hours. Remember our detailed discussion of AGP patterns in Chapter 3?

An example of the value of the AGP is a CGM pattern seen in a subgroup of patients who have a tendency to eat in the mid- to late evening or even binge during those hours. These patients often control their carb intake during the day in a pretty disciplined manner, sometimes with fasting. However, they have great difficulty controlling carb intake before bedtime, even after a good dinner. The AGP demonstrates this pattern, and when they see this data in front of them, they see that this eating pattern is undermining their weight-loss efforts. This understanding, and the desire to not repeat this pattern, is effective in helping eliminate most of this behavior. The motivation the data provides for most patients is truly remarkable.

Retrospective trend evaluation for nondiabetics is a very important component of CGM use. Looking at past data and its patterns helps highlight consistent trends and leads to changes in both eating habits and lifestyle. Interpreting patterns is less complicated than with diabetics, as the impact of medication management (insulin, oral hypoglycemics) doesn't need to be considered. The user and their doctor must only consider the major variables that affect blood-glucose patterns: diet, fasting, and activity regimens, the most important of which is diet—specifically, carbohydrate consumption.

## **I'M HONORED MY PATIENTS SHARE THEIR JOURNEY WITH ME**

I've said that CGMs change lives, and we all know this only occurs with patient effort. But many of my patients are also kind enough to express appreciation for the work I do helping them achieve this change. So I feel very fortunate that they have chosen me as their doctor and provided me the privilege of working with them. I achieve a tremendous sense of satisfaction from their progress. It is because of their effort that I am able to feel I am helping them make meaningful changes in their lives. Most of them very, very gracefully reinforce this feeling of satisfaction for me with a simple, "Thanks a lot, Doc." I then feel that my efforts on their behalf have made a difference. And when you see pounds being shed, A1Cs dropping, symptoms of disease going away, and lives truly changing, everyone wins.

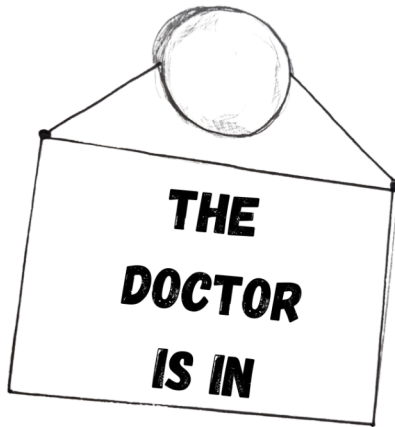
As happened with Lorie, I get to play a role in improving lives. So, whether it is a twenty-one-year-old losing seventy pounds and choosing a healthy path that will last a lifetime or a forty-seven-year-old reversing prediabetes so they never become diabetic, I get to share in that success. I have always enjoyed being a physician, whether in the ER or in the office. For a long time, I did that by intervening in acute medical situations in the emergency department. I now get to help prevent those acute situations—diabetic emergencies, strokes, heart attacks—from ever happening.

I've heard other docs say that medicine has changed... and it has. They don't like the health-care environment any more. Most of us no longer work for ourselves, as was mostly the case when I got out of school. It was an era when you could just "hang out a shingle" alone or join a private group



practice. In either case, it was your business, your practice. You worked for yourself on behalf of your patients. Today, most of us work for large health systems or even companies that trade on Wall Street. We answer to insurance companies. Some of my colleagues in these larger organizations only get twenty minutes for an appointment with a patient, just enough time to provide disease maintenance. They are frustrated that they can't do more for their patients. And I sometimes hear them say they can't wait to retire or that they would never recommend their kids go into medicine. I disagree.

But I'm fortunate enough to be providing good care in my own practice with a great team. I get to routinely spend an hour with my patients each visit, sometimes more. I don't just manage metabolic disease. I get to help prevent and reverse it. And CGM technology, along with my team, a well-thought-out comprehensive metabolic-health program, and my patients' hard work, changes lives. Their lives. The golf course will mostly have to wait for a few more years, and I would not have it any other way.





## BEYOND THE BOOK WITH DR. PAUL

I hope this is the last diet book you ever read. These pages have presented more than just a diet; CGMs provide the opportunity for a meaningful and permanent lifestyle change. The outcome of this change being both weight loss and improved health.

You can follow all the directions in this book yourself if you have a physician to prescribe the CGM for nondiabetic use and provide reasonable expertise to help you set attainable goals and implement sustainable habits. But very few people have that. Experienced metabolic-health providers versed in these techniques are still relatively rare. If you don't have ready access to a medical professional with a team to provide these services, let us know if we can help. We provide services in the states I am licensed in (OH, FL, AZ, and IN, with more to come soon), and sometimes patients drive (or even fly) into my licensed states so we can work together.

If you feel I and my team can help, take a few moments to complete the New Patient Inquiry on our website. Once this information is received, a member of our team will contact you to discuss how we can help you meet and exceed your specific goals related to weight loss and optimal health. **Go to [www.doctorkolo.com/new-patient-inquiry](http://www.doctorkolo.com/new-patient-inquiry).**

Getting all the way to the end of this book means you're a finisher. You know what you want, and you are obviously motivated to obtain it. As with Lorie, you can do this. It is helpful to have an experienced team to guide you. We have provided the information you need to move forward, but you need a knowledgeable partner. So, whether you reach out to the Metabolic MD team or find another provider to assist you, you can achieve success both in weight loss and in metabolic health. Just by seeking a knowledge base in CGMs and improved metabolic health, you've shown you have what it takes to follow through and succeed. Thank you so much for reading this book, and I wish you the best on the next stage of your journey to better health.



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# **DISCLAIMER**

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## ABOUT THE AUTHOR

Paul Kolodzik, MD, is certified by both the American Board of Preventive Medicine and the American Board of Emergency Medicine. In a thirty-year emergency room career, he has cared for countless patients in crises with such conditions as heart attacks, strokes, and diabetic comas. Dr. Kolodzik has witnessed firsthand the failures of mainstream diets and the medical system overall, which prioritizes medications and surgery over diet and lifestyle changes to prevent and reverse disease. Dr. Kolodzik thoroughly explains how the new technology of continuous glucose monitoring (CGM), used only by diabetics until recently, can help achieve weight loss and improved health for nondiabetics as well.

In *The Continuous Glucose Monitoring Revolution*, Dr. Kolodzik shares how he has helped thousands of patients use CGMs to lose weight and prevent and reverse metabolic diseases such as hypertension, high cholesterol, prediabetes, GERD, sleep apnea, fatty liver disease, and others. He has had a full-time metabolic-health practice since 2016. In this book, he presents a comprehensive program for metabolic-health success using a CGM device. This program includes approaches such as targeting carbohydrate intake goals, intermittent fasting, strength training to decrease insulin resistance, and even the use of the new FDA-approved weight-loss medications (semaglutide, Ozempic, Wegovy, Mounjaro).

Dr. Kolodzik graduated from the University of Notre Dame and completed medical school and residency at Wright State University, where he served as chief resident. He is a founding member of the Society of Metabolic Health Practitioners.

Learn more about Dr. Kolodzik and how he helps his patients lose weight, reverse disease, and improve health at [www.metabolicmds.com](http://www.metabolicmds.com). He can also be followed on Twitter at @drkolomd, on TikTok at @dr.kolo.md, on YouTube at @metabolicmds, on Instagram at @metabolicmds, and on Facebook at The Metabolic MD with Doctor Kolo. Dr. Kolodzik also hosts The Metabolic MD Podcast, available on Apple Podcasts and Spotify.

