Ordering information at http://sugarsurfing.com

False Idols

Chapter 5

In order to move from purely static teachings about how to manage diabetes, a person needs to embrace the idea that much of what they have been taught has been grossly oversimplified. If you believe this statement is too strong, then just consider how much of the diabetes basics we're taught are riddled with exceptions, inconsistencies, and nuance. This chapter's theme is to point out that just about everything in diabetes self-care we've been taught as constants, are at best, only estimates. This idea will strike many as heresy. But as a doctor who also trains other doctors, I can attest that many providers in the healthcare field struggle with the ambiguous nature of working with persons with type 1 diabetes. Don't think static thinking is only a challenge for patients to grow beyond. The medical profession needs to move ahead in their thinking as well.

The good news is that our ability to handicap and estimate the forces that influence our sugar levels can be exercised much like a muscle. It

just takes the right mindset. In the late 90's Sci-Fi thriller "The Matrix", Neo is confronted with a pivotal choice early in the plot of the film by his mentor Morpheus. When Neo is told that the world around him is nothing more than a computer generated fantasy and that he can choose the true reality and perhaps rewrite the course of history, Morpheus extends his open hands holding a red pill in his right palm and blue pill in his left.

"This is your last chance. After this, there is no turning back. You take the blue pill - the story ends, you wake up in your bed and believe whatever you want to believe. You take the red pill - you stay in Wonderland and I show you how deep the rabbit-hole goes."

If you've read this far, it's now time for you to make a choice. If you wish to see the world of diabetes as largely black and white, utterly predictable and capable of being managed well by only a few simple actions each day, then put this book down and go back to whatever you were doing. But if you choose to explore the true diabetes Wonderland with all its inconsistencies and contradictions, then read on.

How many of us truly realize that the numbers which seem to be everywhere in the management of diabetes are merely rough approximations and not commandments inscribed on a stone tablet? What numbers? How about meter results, carbohydrate counts, insulin doses, insulin correction factors, insulin to carbohydrate ratios, and A1C results, just to name a few. Diabetes is overrun with numbers. And with numbers comes a tendency to judge; often too harshly. We become our own worst critics which mostly serves to hold us back rather than move us forward.

Because of our vulnerability and lack of knowledge, skill, and emotional stability when we're first diagnosed, we rarely question the

numbers that are assigned to us. And we're taught to embrace each of these numbers as if they exist in discrete and separate bubbles (e.g. X + Y always equals Z). How the numbers are determined may not be explained by your doctor, but given to you as a set or rules to follow.

Factors common in the first year or so after diagnosis (regaining lost weight and the end of the "honeymoon" phase) usually result in a gradual need for more injected insulin to maintain adequate blood sugar control. Then to make it worse, many practices instruct the patient to never give a correction dose of insulin unless blood sugars exceed 250 mg/dL (13.9 mmol/L) and only at the planned meal time. Such a conservative approach is felt to be in the patient's best interest at first. But like wet concrete, these instructions often harden around the patient or family's feet leaving little to no flexibility as time moves forward. This is how the static invades our perspective and in so many ways.

Could there be a better way to handle this transition? Of course. But how could a remote medical team possibly teach one newly diagnosed patient how to do this on their own and safely, let alone hundreds. Herein lay the beginnings of the "false idols" (myths and untruths) that are so common in diabetes. If you've managed diabetes for any length of time at all you either get extremely frustrated and depressed while clinging to these static numbers or you begin to understand that there is a pervasive flaw with trying to control blood sugar using 'Diabetes by Numbers'. I prefer to call this the Static diabetes management.

This chapter is critical for anyone considering a switch to Dynamic diabetes management or what I call Sugar Surfing. For those who find it hard to let go of Diabetes by Numbers you will struggle as a surfer. Anyone who has ever body surfed or used a boogie board knows that there are some things you must leave behind when you begin to learn how to surf. For example, if you hold on to the comfort of the prone position, close to the water with a low center of gravity and are hesitant to pop-up on your new surfboard, it will take you much longer before

you get to experience the thrill of a long ride with a clear view of the beach.

Over the next several pages many of these myths and untruths will be exposed. Knowing that much of what we've been taught needs to be at least questioned, marginalized or dismissed entirely is critical for your success as a Sugar Surfer. For many, simply understanding that these numbers are merely guides or starting points and that you need to test their validity often may be the breakthrough you need. With this new perspective, the artificial barriers placed in front of you by false idols can be avoided. And make no mistake; these idols have been in place for decades created and perpetuated by well-meaning people in positions of knowledge and authority (myself included). They too have become comfortable with these idols and continue to light candles around them to help show you the way.

It's not that what we teach diabetes patients is necessarily wrong. Rather, it's incomplete. To explain all the exceptions as a rule or guideline is being explained, or a new technology is being taught to a user, can quickly become overwhelming to a person who is relatively new to diabetes. But given how poorly we educate persons with diabetes overall, at least beyond the basics, it's easy to see how we aim to help the most people by keeping diabetes teaching methods focused on simple actions and concepts. In essence we tend to oversimplify, often to an extreme.

Furthermore, many patients with diabetes may not want this flood of information and nuance at first. They might find it overwhelming, confusing, and overrun with medical jargon. Some patients may struggle with understanding basic health issues based on their personal, educational or cultural background. If you're not careful, embracing these false idols will keep you from realizing your aspirations of a more normal life. In no particular order, I present to you the "False Idols" of diabetes:

Carb Counting

One basic principle of medical nutrition training (MNT) for diabetes is to attempt to quantify (or at least regulate) the average amount of carbohydrates, fats and protein consumed each day, based on each meal and snacks. Carbohydrates are largely converted (at least 90%) into sugar (glucose) by the process of digestion and absorption in the intestines. Smaller percentages of fat (3%) and protein (7-10%) can experience a similar fate. Carb counting is based on the premise that it's best to focus on tracking carbohydrates and allow greater latitude with fat and protein in certain situations. This should not be a license to disregard these two other macronutrients since they do contribute calories (4 calories per gram of protein and 9 calories per gram of fat) and can affect other aspects of health.

So, learning the difference between fats, proteins and carbohydrates is an important step in managing blood sugar. Fats and proteins tend to slow down the digestion process in part by controlling how quickly the stomach empties food into the intestinal tract. This is why foods with a combination of macronutrients (carbs, fat and protein) may affect the rate of change in blood sugar differently (slower) compared to whether these macronutrients are eaten by themselves (e.g., pure carbs). At first, some persons tend to think a meal is a meal is a meal, but that perception quickly changes when one starts to look at the differences in blood sugar responses that might follow even when meals are thought to contain identical amounts of carbs, fat, and protein. Fat and protein are broken down by the digestive process into their basic building blocks and used for growth, cellular repair and other vital bodily functions. Carbohydrates are used largely for energy (sugar) but also provide substances for numerous bodily functions. The reality is that we require all three macronutrients to survive. The relative percentages of each that we consume daily is a topic of active debate and I will not take part in that discussion in this book. Low-carb, low-fat, low-protein and everything in between have their vocal advocates in books and online. Sugar Surfing can be done in all these scenarios, but you must

be aware of the glycemic effect of the foods you put into your body if you expect to be a quality Sugar Surfer.

Nearly everyone can utilize simple sugars (e.g. - juice) in short order whereas "complex" carbohydrate foods like pizza, some pastas, and most foods with high proportions of fat and protein combined with carbs, will generally digest much more slowly and deliver sugar to the bloodstream in a more gradual and extended fashion. It's well known that pizza can take several hours to complete the process of conversion to glucose. And it might be further complicated by what is being consumed with the pizza including the toppings (pineapple?), sugary beverages, a salad with fatty dressing and even how well the food was chewed.

The act of chewing is the first step in digestion within the body. Saliva contains enzymes which begin the digestion process, and chewing starts to break larger pieces of food into smaller ones. Once in the stomach, this process continues, aided by powerful stomach acids and enzymes. The process of cooking food is also part of the digestion process. Heat applied to foods starts to break down the chemical structure of food, making it easier to breakdown and digest. This is why equal amounts of a rare steak may deliver fewer calories than a well done steak, since a portion of the rare steak may never get broken down enough to be completely absorbed by the intestines.

The concept of carbohydrate counting could lead some to believe that eating can be a science. That might be possible in a clinical research lab, but in the real world, carb counts are estimated at best. Factors beyond the actual amount of food eaten will influence how the body breaks down and absorbs the food or meal.

A study done a few years ago with type 1 teens involved thoroughly teaching them carbohydrate counting skills using the foods they preferred to eat. Then after just one month, when these same teens were tested to demonstrate their proficiency, less than one quarter of them could accurately count carbs within 10 grams of an assigned food that

they preferred to eat. Few persons will ever get the extensive training those teens received as part of that study.

I'm not being dismissive of carb counting. On the contrary, I attempt to quantify the carbs in everything I eat. But I just don't stop there. I realize that even if I read a label or weigh a portion, my body's blood sugar response may respond to that food differently from day to day, or even from meal to meal. I'm also careful not to become anxious over this step and quickly come up with my estimate. I use carb counting as a starting point, not as the final answer. If I guessed incorrectly my surfing skills are there to help me catch the next wave.

Only through personal experimentation will you be able to avoid surprise lows and highs that can be associated with this inherent variability that is simply part of eating food and drink. My aim is to avoid or minimize mismatches between my insulin action and the entry of sugar into my body based on the rates of conversion of the mixture of carbohydrates, fats and proteins in the meals I eat.

Hopefully you have access to a diabetes education program with a skilled dietitian experienced in teaching how to best estimate (count) carbs. Hopefully you get to see this professional as often as you wish to learn this important skill. However, just like we were taught about the reliability and constancy of insulin ratios, we need to understand that carb counting is a necessary but hardly infallible skill due to all its "baked-in" variability. If you've found yourself perplexed with inconsistent blood sugar responses in spite of meticulous carb counting efforts, you've gotten caught up in applying the principle of precision thinking to things that are inherently imprecise. That is a recipe for frustration. Sugar Surfing can free you from this.

"How many grams of carbohydrate are in an apple?" How big is it? What kind? How ripe? How big is the core in relation to the total size (the part you don't eat)? Teaching someone how to accurately and precisely count the carbs in an apple would be a very difficult task and would take many hours of training. For someone who is highly

sensitive to insulin, just being off by 10% could result in a significant swing in that person's blood sugar.

Perhaps a better approach is to think of food in terms of Estimated Food Impact (EFI). Because there are so many variables in play around food, why not think of that food as part of a situation rather than only a specific number of grams of carbohydrate. Things to consider when coming up with an EFI for that food event include: a rough estimate of the grams that will convert to sugar; the speed at which this meal or snack will convert to sugar; how quickly is my blood sugar rising or falling based on CGM (which may need to be verified by finger stick); if blood sugar is high, how long has it been high; and many more considerations.

So, take your best shot at counting carbs, estimate your insulin needs including the situation, take a bolus from your pump or give yourself an injection, and here's the important part: study the impact of your actions using a properly calibrated CGM! I can't stress this enough: You are far better off to simply monitor and manipulate blood sugar movements rather than obsess over calculating the accurate number of grams of carbohydrate in a given apple. If in doubt about what or how much you will eat, you may always take a smaller "leader dose" of insulin to get the process of sugar disposal started. This will be discussed later.

I use the following metaphor to drive home the fallacy of insulin ratios and carb counting as stand-alone tools for tight control.

What would you say to the golf pro that told you "All that's required to find the green is a) choose the right club, b) grip it properly, c) maintain the correct shoulder stance, d) keep your eye on the ball, and e) shift your body weight properly as you swing through the ball. If you do these things you will always find the green and just maybe… a hole in one"?

Your first thought should (appropriately) be "You're nuts"! So why should we believe a spot blood sugar level plus a measured amount of

food (carb counted) plus an insulin dose from a static formula (e.g. your insulin pump 'wizard') will consistently result in an in-range blood sugar level 2-3 hours later? That's nuts!

Basal insulin

It's common to hear persons with type 1 diabetes say "I want to get back into better control" or "I need to get my insulin dose regulated". Both statements suggest that diabetes control is a place to go to or that there is an insulin prescription that is just right, and we just haven't found it yet.

Basal insulin is a great example of static thinking. Insulin pumps are programmed to give the same rate profiles each day unless the user changes something, such as applying a temporary basal rate. But even this is rarely done unless under a doctor's direction and even then, it's done infrequently (such as during illness). But the basal insulin needs of a person are constantly changing from day to day even in good health. This is well known and not new science.

Insulin pump therapy seems to encourage static thinking given its need for stored ratios. Think about it this way; the body does not have a quota of insulin to deliver each day, it simple responds to the needs as they present themselves. Even basal insulin needs drift up and down each day based on circumstances not under anyone's control. Illness, medications, stress, sleep disturbances and changes in activity levels will influence the amount of insulin produced between meals and snacks in non-diabetic people. This is yet another reason why blood sugar levels don't travel along a straight line in non-diabetic persons.

In the world of Sugar Surfing, the basal rate is like everything else: just a starting point. It's not the end all and be all many believe it to be. It too requires daily attention (in the form of CGM trend checks when glancing at the readout) and at times daily adjustments to keep the BG trend line within your target range.

If basal insulin delivery by injection or insulin pump consistently causes upward or downward drifts in BG in the absence of food, activity or stress, then changes to those doses or settings are usually needed. But failing to appreciate the imprecise nature of basal insulin often leads persons down a path of making frequent basal insulin changes which makes matters more complex without any significant improvement in overall BG control.

Insulin to Carbohydrate Ratios

How are you feeling today? Is your gut healthy or under stress? This affects the absorption of nutrients and thus to what degree the carbohydrates get broken down and absorbed into the bloodstream. The intestines are in essence a large sheet of biological tissue capable of absorbing the products of digestion. In other words, taking substances from outside our bodies and moving them inside our bodies. Any condition or disease that affects the stability or size of that large sheet can have a temporary or permanent impact on what gets into our system.

Some persons with type 1 diabetes also develop celiac disease. This condition is caused by an allergic/autoimmune response to the substance gluten found in many natural grains. If poorly treated, celiac disease can reduce the absorption of nutrition from the intestines by flattening the villi, those little fingers that line the small intestine, thereby exponentially increasing the size of that absorbing sheet. Undiagnosed or improperly managed celiac can result in inconsistent glycemic responses to food. But many other intestinal disorders can also affect how the gut absorbs things.

Short-lived conditions like viral gastroenteritis and other diarrheal illnesses can temporarily damage the gut's ability to absorb nutrients. This effect is fortunately temporary. There are many instances where the intestines can interfere with the predictability of food on blood sugar response.

There are also many variables in play when it comes to the relationship between insulin and food. Unfortunately, I feel the medical establishment has unwittingly done a disservice in attempting to simplify such a complicated facet of diabetes self-care. With too much emphasis on drugs and machines and less on education, coaching and long term support, we have taken a very expensive (and in my opinion misguided) path to the management of diabetes from a population standpoint.

In truth, insulin and carbohydrates are constantly moving targets. Even your body's ability to make use of the exact same foods has been proven to be different from day to day.

If you don't believe me why not try this little experiment. Take a loaf of bread, a tablespoon of peanut butter and a tablespoon of jelly. Weigh each of these so you can be sure that you have the exact same amount of the different nutrient profiles. Also, don't forget to calibrate your weight scale before you weigh your food.

Plan to eat your sandwich at the exact same time on both days and try to have your blood sugar within 30 points or so when taking the challenge. I think you'll find that you get different results. Go ahead and try the challenge again but this time eliminate even more of the variables from day to day. You can see that what I'm suggesting can easily be described as unhealthy behavior, and that is the point. We have all been taught that adhering to formulas is the key to better control, yet in order to make the formulas work we can easily become obsessed with the minutiae. And no matter how hard we try, the results will often times be different.

Why not give yourself a break and commit to learning how to surf? That freedom is called Sugar Surfing and it requires you to manage in the moment. It also requires you to rely on your memory a bit as snap decisions can be aided by recent memories of how you dealt with similar situations and what those results were.

Insulin Delivery Devices

This idol comes in a few different forms. One for those who use an insulin pump, another for those of you who give yourself multiple daily injections (MDI) by syringe and yet another for those who use an insulin pen.

For you pumpers, did you know that each pump is unique? Not only do pumps vary between manufacturers and model numbers, each pump is slightly different than the one that came off the production line before and after. Machines change and degrade over time, which may change its performance. Are your pump settings being regularly calibrated and inspected to ensure that the manufacturer's standards are still in effect? We do this for our vehicles every year. Yet, we have insulin pumps that take a beating every day and we only worry about replacing them when they completely break, or when 4 or 5 years have passed so insurance will pay for a new one. How crazy is that?

If you don't use a pump then you're on MDI using either an insulin pen or syringe. These are machines, too and have variance built in as well. Ever had a "wet shot" where some of the injected insulin sneaks out after you remove the needle? This can easily happen if you're not careful, and sometimes even when you are. Unfortunately, there are so many injections over the years that many fail to look for this potential confounder. They just inject and forget. User error comes into play on a regular basis, not because you didn't try, but sometimes that injection just didn't go as planned. Remember to look as you withdraw your syringe and if you see that some of your insulin is making a break for it don't stress. Just keep in mind that the near future is now ripe for higher blood sugars than expected. Because your Surf Wagon has many tools in it besides insulin, you can add in an activity or adjust your meal to match that lost insulin.

So when you wonder why corrections don't always result in bringing you back to your target, my advice is to move on and take another view toward your next step. Far too much time and energy is

wasted on wondering vs. doing in the realm of diabetes self-care.

Duration of Insulin Action (DIA) – (aka: Insulin on Board (IOB) and Bolus on Board (BOB).

Regardless of how you get your insulin, insulin works differently from day to day even in the exact same setting. In some people, '24 hour insulin' only lasts 16 hours on one day but 22 on another and 26 hours on another. Some may experience a spike in the insulin action using a long acting insulin as opposed to the straight line effect most of us were taught.

Insulin delivered through your skin must traverse a gauntlet of obstacles to reach its final destination: your individual cells. Assuming the properly measured amount is taken, enzymes (insulinases) located in the skin start to degrade insulin as soon as it's injected. Also remember that a lot of kids (and some adults) forget their meal or snack doses altogether, take them late, or deliver an incorrect dose. Once insulin reaches a small blood capillary and gets whisked into the bloodstream, it's taken directly to the liver, which destroys a large and variable percentage of what gets delivered. After passing through the lungs and back to the heart, the insulin gets pumped out to the body where it eventually comes into contact with individual cells. These cells possess special receptors on their surfaces which bind to the insulin and set in motion a series of chemical reactions which result in specialized molecules called glucose transporters to move to the surface of the cells. It's through these transporters that sugar (glucose) is able to move into the cell and be used for energy to power all cellular functions.

As you can tell from the tortuous path that insulin takes, there are many locations along its journey where it can be destroyed. It's estimated that about 90% of a subcutaneously (through the skin) injected insulin dose is inactivated by the body before ever reaching its target destination. Some days are better than others and more or less insulin reaches its final destination unscathed. But the point here is: variability rules.

Other variables affecting insulin uptake involve the temperature of the skin at the injection site, the location of the site (arm, abdomen, leg, hip), the rate of blood flowing through the site itself (like an exercising body part), plus tiny differences in the depth of the injection. Other factors like smoking or dehydration will influence (slow down) how insulin is absorbed from an injection.

The amount of insulin injected will also tend to influence how long it hangs around. Larger doses of rapid acting insulin last longer than smaller doses. The same can be said about longer acting insulins.

Modern insulin pumps allow the user to automatically estimate how long an insulin dose is expected to be able to keep lowering blood sugar after that dose is delivered. This programmable value is called the duration of insulin action. If the pump "remembers" how much remaining insulin action is present since the last bolus dose, it can remove or subtract insulin from a later dose if that dose falls within the period of time when another dose may be needed to correct an out of range blood sugar level or "cover" an extra amount of carbs eaten. But since the DIA is a number, we're immediately at risk for becoming trapped in static thinking mode. The DIA is just an estimate, and it is often assigned based on assumptions made based on age or even the brand of insulin being used. Sugar Surfing allows for ways to determine the duration of insulin action using a CGM device and careful observations of the trend line after the insulin dose is given.

When deciding upon the duration of insulin action time to program into a standard insulin pump, the doctor may apply a middle of the road estimate such as 3, 4 or 5 hours. These values can and should be confirmed by careful BG trend line checking with a CGM. A future chapter will show you how using Sugar Surfing can help you to "see" what your DIA is on any given day. This forms the basis of the I-chain maneuver using insulin injections to emulate a combination or extended bolus function when eating a meal with complex or slow digesting carbohydrates.

Numbers

Too many numbers, indeed. Driving is a funny thing. Every once in a while I look at the speedometer but I can pretty much tell how fast I'm going by watching the other cars around me or how quickly trees pass by. My car doesn't have a 3D directional indicator like you would find on the dash of an airplane. I can make tiny adjustments on the fly. If I'm drifting right I gently nudge the wheel to the left. If a ball rolls onto the road in front of me I hit the brakes or steer around it. I'm a successful driver because I'm paying attention to all of those little (and big) things around me all the time. That's why I don't need numbers to drive.

Similarly, there are no numbers in surfing other than the score a judge gives you. Yet surfers are able to manipulate the immense power of the ocean to create awe inspiring drops, bends, turns, aerials and yes… wipeouts. With the aid of a CGM and situationally appropriate guide rails, I can easily see how I'm doing in relation to that imaginary line that runs down the middle of my wave. Most of what I'm doing becomes second nature.

But alas, numbers do become necessary in diabetes. Insulin doses are numerical and blood sugar levels are as well. I sometimes wish we could go back to a color based approach from my childhood. Red zone, green zone, blue zone, yellow zone, etc. Aim to stay out of the red zone and more in the green. Colors between green and red could emphasize need for lesser actions to steer the sugar levels back into green. Sound far-fetched? Perhaps, but it might be associated with less angst and guilt based on the judgment that comes with numbers.

Numbers remain a necessary element of our care but they should not overshadow the intuitive aspects of our self-management.

Calibration

Machines that determine values typically require a process to compare the result from the machine to an outside reference standard.

The process of adjusting that machine to match the reference standard is called calibration. Many modern timepieces are calibrated to the atomic clock. In diabetes, calibration is supposed to be performed by the patient. Rarely is this done. Blood sugar meters come with control solutions to test the accuracy and quality of test strips. Less than 7% of meter users ever use control solution. But even if they did, there is tremendous variance in the accuracy of commercial blood sugar meters, even under ideal circumstances.

In the USA, the Food & Drug Administration has a process for allowing blood sugar meters and test strips to be sold to the public. The current FDA guidelines allow variance in the reading on the meter from what a highly accurate laboratory analyzer would report on the same sample. If the actual BG value is over 75 mg/dL (4.2 mmol/L), acceptable values from the meter could be 20 mg/dL (1.1 mmol/L) above or below the actual value and the meter would still be considered acceptable for use by the public. If the BG was under 75 mg/dL, the variance must be 15 mg/dL (0.8 mmol/L) or less (that's a 30 point range! [1.7 mmol/L]). Finally, in 5% of test cases, the value can deviate from the actual reading by ANY amount. There is a movement afoot to tighten up these variances but for now realize that this false idol is real and account for the possibility that the number you see is only a ballpark estimate.

And none of this takes into account poor BG testing technique on the part of the patient (e.g. unwashed hands, barely large enough sample size, squeezing the finger and alternative site testing among others). I'm not even counting those times when your child gets a friend or the family dog to offer up a sample of their non-diabetic blood to cover up that piece of cake you said "No" to. These data are being used to make decisions about self-care by the patient and at times the doctor. Plus, these same data are used to calibrate a CGM device. The reality is that commercial blood sugar meters provide estimates of blood sugar levels. Just try repeating BG checks several times in a row and see how variable the results can be.

This doesn't mean that modern BG testing is worthless. The results obtained from a properly collected sample are still very useful for individual use and sufficiently accurate for calibrating current generation CGM devices. The take home message here is that care must be practiced in the collection of these data. And, if the meter result is inconsistent with the situation, always question the meter result before questioning the situation. In other words, don't hesitate to repeat a blood sugar check by meter when your senses tell you something is amiss. Make sure you read Chapter 6; "Waxing Your Board".

Hemoglobin A1C

Like blood sugar meters, did you know that even the best office based A1C analyzer machines have leeway or variance in their accuracy and precision? For example, when you are given a number, that result can be +/- 10% of the true result. Further, studies show that with the point of care A1C analyzers, the ones that give results in minutes using just a finger stick blood sample, your result can be more than a half point off when compared to the result obtained using the same sample on one of the most accurate laboratory analyzers.

Unbeknownst to you, your A1C blood sample may be analyzed in a different lab, using a different method, on a different lab analyzer and by a different lab technician. All of these differences may contribute to meaningfully different results.

On a positive note, there is now a method that helps standardize A1C results from different methods based on an internationally accepted standard. This is now being adopted in most major laboratories worldwide. However, the point of care A1C analyzers are not included in this change.

The moral of the story? Don't get too hung up on whether or not your A1C went up or down by a 0.3. That kind of difference is easily within the acceptable variance of the technology and may have very little to do with how hard you worked at managing blood sugar. Yet, we smile or cry when we see or hear that the A1C went down or up by

even as little as a half point. A better use of that number is to assess what you did to influence the A1C and how your actions contributed to those results within a wider range of the spectrum. For example, an A1C of 7 vs. 9. As a surfer, your experiences in the moment far outweigh the importance of a single number on your quarterly report card.

Maybe we should bring the use of colors into the discussion here, too. Each 1% change in A1C could be associated with a different color scheme. Unfortunately, I witness too much unnecessary anxiety over minor differences in A1C which can be easily explained away by the sheer variability inherent in the laboratory analysis process. For example, a child's A1C which apparently goes up from a 7.8 to 8.1 is somehow interpreted by some as 'being a bad parent'. Where this guilt comes from I do not know but color reporting might eliminate a lot of this anxiety and senseless guilt. More food for thought I suppose.

Basal Profiles

How many different profiles do you have programmed in your insulin pump? When was the last time you tested your basal profile or dose? What is going on with the ratio between basal vs. bolus as a reflection of your total daily dose? In other words, do you really think that your body is the same day in day out or might there be some wiggle room here and there? Absolutely! For starters, if you have six basal profiles, why not try to see how you do with only five. The reason is that the more variables you remove from the equation, the easier it is to predict what might happen in the future. Studies have shown that fewer basal rates leads to clinically significant improvements in outcomes. Simpler is better!

The reason for so many basal rates can be traced back to how many doctors think. When I was a static thinker, I would look at BG patterns and make changes to basal rates rather than spend time addressing insulin dose timing or what was being eaten. Since doctors are authorized to prescribe, that's what I did. Looking back, I was seduced

by the idea that changing pump settings was the answer to most problems. Plus patients might have thought something constructive was being done. I do think I helped in many cases, but I was not really addressing all the things that contributed to the BG patterns I saw.

Today, I advise patients that a basal rate (whether by pump or by injection) is intended to maintain stability in BG trends… mostly. If your 8 basal rates allow you to maintain a steady BG track in the absence of food, day after day, then that's what you need. But I rarely find that to be the case. Fluctuating basal rate delivery via a pump can be a major contributor to overall variability in blood sugar profiles.

Personally, I've evolved to using a single basal rate in my insulin pump. Now that might not work for everyone, but I advise anyone using a pump to keep the total number of basal rates to the lowest number necessary to maintain stability whenever food is delayed or omitted.

Glycemic Index (GI)

This is yet another number to consider when deciding the impact of a given food on blood sugar levels. Low, medium and high glycemic index foods convert to sugar at variable rates of speed. It's more helpful as a qualitative tool than a quantitative one. This is an extension of the fallacy that goes with relying too much on accurately counting carbohydrates. For example, when someone quotes you a GI for an apple, the best way to interpret this is how quickly it might raise the sugar level. The actual glycemic index value assigned to the apple would not help you much with calculating an insulin dose for it. Especially if you are combining that apple as a topping on your ice cream, sautéed in butter and smothered in cinnamon and nutmeg. A better approach might be to look at meal and snack time with an eye toward all of those things that need to be considered before taking a preemptive or corrective action, which may or may not include a dose of insulin.

Insulin Dosing & Delivery

No matter how you get insulin inside your body, the tools we use are not entirely accurate or precise. There is always acceptable variance in the manufacture of plastic vessels, tubing and syringes. Insulin pumps have an acceptable variance when told to bolus a specific number of units. Did you know that when you use your insulin pump to bolus 1 unit of insulin it can be off by a range of plus or minus 30% - 200%? In relation to the powerful effect of a small dose of insulin, even small variances from shot to shot or pump bolus (including basal delivery) can have a meaningful impact on resulting blood sugar.

As to battery operated machinery, do you ever notice a difference in the performance of your electronics as the battery level goes from full to empty? Why would medical devices be immune to the Law of Variability?

Tunneling is a phenomenon of leakage of insulin around the edges of an infusion catheter outward towards the surface. This creates loss of expected insulin, is often unnoticed, and contributes to unexplained insulin responses. I've used Sugar Surfing to suspect and successfully identify tunneling in the past.

Air bubbles in tubed insulin pumps is another source of blood sugar variability that often goes undetected. This is best addressed by careful reservoir loading and proper priming of the infusion set before catheter insertion. Also, an occasional visual inspection of the tubing for bubbles or large air gaps can avert a case of hyperglycemia or worse.

Insulin action

Some people assume that injected insulin has the same action every time it is injected. This is false. There are multiple factors that impact insulin action. This applies to all types of injected insulin. This variability is discussed Chapter 12; "Surf Safely" and throughout the book.

Fractional Unit Doses

In the mid 1990's at a medical conference, I met Dr. Paul Davidson from Atlanta, Georgia. Paul has been a pioneer in the field of clinical use of insulin pump therapy. In the 1980's he and his colleagues asked some very important questions regarding how to properly calculate insulin doses using the pumps of that era. Back then pumps were not enabled with calculators as they are today.

Dr. Davidson and colleagues had developed mathematical models to estimate insulin requirements for meals, corrections and basal rate determinations. In a short time, his ideas had earned widespread acceptance. But I had noticed that more and more patients were taking his concepts further than they were originally envisioned. For example, using insulin to carbohydrate ratios parsed to the decimal point.

Personally, I found this obsession with ultra-precision in insulin dosing a bit unnerving since I didn't usually see any improved control in patients who practiced it. When I mentioned this to Paul, I was struck by his response. He said that his basic dosing formula algorithms were never meant to be anything more than basic starting points for proper dose selection.

The way they had been morphed into decimal-point calculations was bemusing. I saw this as a good idea taken to an extreme. Certainly not by its creator, but by an eager and willing diabetes pump wearing patient population ultimately searching for a sense of certainty in a world of chaos.

This phenomenon is alive and well today and has become part of established diabetes practice. Much clinical research has been dedicated to parsing these insulin dosing formulas to their most sophisticated forms. Insulin pump manufacturers have even expanded their dosing accuracy to two decimal places if nothing else to differentiate their newest pump. Yet when these formulas are applied to the free-range patient (outside the clinical lab), they still constitute a static approach to care.

Day to Day Variability

It's true that there are high and low tides within the body for many hormone systems. These can influence blood sugar levels and response to insulin. Growth hormone, cortisol, estrogen, progesterone and testosterone can exert direct or indirect effects on blood sugar levels. But like much of what you've read about so far, these hormone surges are not as predictable as high and low tides in the ocean. Plus their impact does not occur in a vacuum. The variance in insulin, food, stress, illness (if present) and exercise all muddy the waters of predictability. But there are situations where hormonal high and low tides can be incorporated into Sugar Surfing strategies. So, understanding and appreciating their existence is very important.

One old Greek saying goes "You can never step into the same river twice because new waters are always flowing over you". This best summarizes how an experienced Sugar Surfer approaches the waves of sugar washing over her. In the Surfing world, each new wave is and will always be, unique.

Insulin Pumps

Insulin pumps have been around in some form since the 1970's. I've worn a pump for over 3 decades. I've also seen a mythology arise around pump therapy that almost rises to the level of a minor religion. Social media fans the flames of pump mania, too. Sometimes persons with diabetes get treated by other persons with diabetes as second class citizens because they don't have an insulin pump.

Don't misunderstand me, insulin pumps can be a positive force for better diabetes self-management, but they can be equally destructive and disempowering if improperly prescribed. Years ago I coined the "12 Commandments of Insulin Pumping", the first and most important of which is "An insulin pump is no better or worse than the human being attached to it" (or operating it). Pumps are no panacea. And a pump is not necessary to Sugar Surf. I used basal-bolus (injected) insulin therapy for 3 years as I developed the Sugar Surfing method to

make this point.

Insulin pumps are also prime targets for misuse. We were all teenagers once. So I know that if there is a way to beat the system or "stick it to the man" I'm gonna do it just because I can. Well, an insulin pump is not foolproof. I won't get into the many ways to beat the system here as I liken that to sending a pickpocket to prison. They went in knowing how to take a wallet and didn't know how to not get caught. A year in the clink and they come out with a degree in crime. Bottom line, open communication and a team approach can't be beat for people managing type 1 diabetes. If you have a child with type 1 diabetes, frequent unannounced review of the pump history, oversight of insulin injections, frequent review of blood sugar history and discussion around meal time decisions are some of the best tools for helping your kid with diabetes. Don't think that buying them a $7,000 USD (nearly 5,000 GBP) machine and all the appurtenances is the answer all by itself. Type 1 diabetes management takes work.

Wizards

Now consider the bolus 'Wizard' commonly found in insulin pumps or in your favorite mobile app. Those calculators use ratios that were setup once upon a time by you or your diabetes educator or perhaps even a company representative. How much follow up has there been to confirm that these ratios are accurate or even to see how good you are at estimating carb counts? I think they should have expiration dates attached to them like everything else.

Can we all agree that the so-called insulin pump wizards are no more Wizards than the man pulling levers behind the curtain? Even though Dorothy in "The Wizard of Oz" should have known better, it took Toto to draw the curtain and expose the truth. I think we would all be better off if we stopped referring to machines and computer programs with magical qualities but rather call them 'calculators' that are also programmed to draw elements of a mathematical equation from a static repository of user (and physician) initiated variables'? Ok,

so wizard is sexy and a lot easier to say but I fear that sometimes people become so enamored with technology that they hand over the decision making, too.

Several people who have really taken off with Sugar Surfing have shared that one result is that they are far less interested in what their pump calculator has to say. It might still be a helpful input to your otherwise complex decision making process but your mind works much quicker and with more inputs than entering estimates of numbers into a static calculator.

Alcohol wipes don't eliminate sugar

Alcohol is not a cleaner. It is a disinfectant. One very important rule for proper use of a blood glucose meter is to wash your hands with soap and water and to make sure your finger is dry before lancing to draw a blood sample. When you use an alcohol wipe you are merely moving dirt and sugar around on your finger until the alcohol dries. If there was sugar on the finger before there is certainly sugar on the finger after. Also, if the alcohol is not completely evaporated it will denature the blood sample and skew your result. Try your best to wash your hands with soap and water before you check blood sugar using a meter. You can then skip the alcohol swab step altogether.

Quarterly Visits with Your Physician

Insurance companies typically won't pay for more than four hemoglobin A1C tests per year for those diagnosed with type 1 diabetes. Coincidence? I think not. For years the only way a physician could know how a patient was doing was to order an A1C test. There are standards for A1C results that also help providers to easily categorize their patients as 'well controlled' vs. 'poorly controlled'. So, when do you need to see your diabetes team? I suppose you need to see them when you need to see them and of course that depends on the quality of your care team and what issues you might be having at the time.

My advice to you is to commit to managing every day and in the moment. Don't cram three months of daily care into a few days of preparation for your quarterly visit. If you need motivation and a method for simplifying daily care then be glad you got your hands on this book. Read on future Sugar Surfer!

Peer Advice

It's not fair to compare. Taking advice from peers with diabetes or even people without diabetes is a recipe for frustration. First, the non-diabetic peers will advise you of all the cures and latest treatments they saw on TV or read about in the Good Housekeeping or Time magazine. They might ask you why you can't take a pill or ask you if it's alright for you to eat that food when dining with them. Second, diabetic peers might tell you how they can do this or that and still maintain great blood sugar levels.

Here's a classic example: cinnamon. Have you heard of that one before? Have you had a well-meaning friend tell you how some new supplement evens out the blood sugar spikes? These pitches come and go and never seem to be accompanied by solid research to support their claims. Peer advice can be helpful but it can also be harmful. Be sure to consider the source of the advice before putting it into action.

It's well known that type 1 diabetes patients can still produce insulin for years after diagnosis. Honeymoon phases can also extend for longer than a year for many persons. Some long term patients produce small amounts of insulin for decades (called micro-secretors). The exact meaning of this remains unclear, but what is clear is that no two persons with type 1 diabetes are completely identical. It's why I advise against general statements for all patients. Individual results may vary, as a famous tagline goes.

High Blood Sugar

There are just about as many largely arbitrary strategies for dealing with out of range blood sugar values as there are doctors to prescribe

them. Some may choose not to treat as discussed earlier, others may be much more aggressive. The methods for determining how much insulin to give have been based on formulas. Hopefully they were further refined and improved by actual observations of their effects. But in the end they are still static in nature. As a provider I aim to avoid high blood sugar but as a realist I know that they will happen. I make every effort to provide tools for patients to correct an out of range single point blood sugar value or CGM trend.

Diabetes management is much more an art than a science, and with major psychological overtones. As much as the medical profession and health insurers might want it to be a predictable science, it won't be that for a long time, if ever.

"Never stack insulin"

This is addressed in Chapter 12 - Surf Safely.

"Never correct out of range blood sugars between meals"

In a recent meeting of diabetes educators, we were surprised to once again hear of entire programs recommending no action for blood sugar up to 250 mg/dL (13.9mmol/L). Patients are supposed to wait until their scheduled meal, check blood sugar and use a "sliding scale" issued to them for adding insulin to their scheduled insulin with a dictated carbohydrate meal plan.

In a static world, I might be able to partially defend this practice. Avoiding a between meal correction eliminates the need to teach critical thinking skills, especially if there is little BG testing being done by the patient. But this argument falls apart in the dynamic world of Sugar Surfing where BG trends rule.

Ordering people to ignore their instincts to correct high blood sugar is simply wrong. It has the potential to create all kinds of strange behavior, stress and complications when simply teaching patients how to safely correct out of range blood sugar using insulin has been broadly taught and accepted. If your care plan includes no corrections

for high blood sugar you would be advised to question your provider or at least ask them to clarify their rationale so that you can fully understand it.

Biologically, this makes little sense too. In 1987 it was shown that the human body produces on average 11-12 waves of insulin from the pancreas each day. This is actually consistent across all persons without diabetes. I'm not advocating 11-12 insulin doses a day, but if non-diabetics produce insulin between meals, then maybe learning how to do that properly isn't a bad idea.

"Never Correct at Bedtime"

For many, a good night's sleep can last 8 or 9 hours. For kids and teens even longer. So why is it ok to let blood sugars run free-range for 40% - 50% of the day? It seems to me that if you're going to work so hard for the 12 hours that you're awake, you ought to have a game plan for dealing with the other 12 hours, too. Your target BG levels can and should be higher during sleep, but there are safe ways to correct a high BG at bedtime or midnight with less risk for a middle of the night low. There is a method called the Sleep Bolus for correcting high BG levels overnight. It's discussed in Chapter 12; "Surf Safely".

Perfection

Perfection is a concept created by humans, not a biological nirvana to achieve. Get rid of this mindset. There is no room for perfection in Sugar Surfing. Just look at a 24 hour CGM tracing of a non-diabetic person and you will see no straight lines. This relates back to the toxic nature of numbers used in diabetes management. If all you hear from your doc (or loved ones) is that a high BG is "bad" and an in range value is "good", you've been set up for a life of recurrent failure since even the best managed persons with diabetes will have an out of range reading at some time or another. The concept of perfect in diabetes care is a mirage. Find satisfaction in a job well done rather than attaining a specific numerical BG target. After all, the number you get may itself not be the exact true value, but most likely it's close enough and living

in a desirable range is far more satisfying than attaining a specific BG value and keeping it there. Even pro surfers in search of The Perfect Wave will tell you that the moment you finish that ride, you realize that there is yet a better wave in your future. If it's anywhere, it's found in the moment. You can't bank perfection.

3 Shots per Day

Stuck on the idea that you are only going to inject X number of times per day and no more? As I said above, the pancreas of a non-diabetic is known to unleash 11 internal insulin bolus events per day. How can you expect to have the blood sugar profile of a non-diabetic if you're not even open to the possibility of giving yourself half that many injections? Too busy to bother bolusing for that snack via your pump since it's a pain? "I'll just wait for dinner and correct then". But now you've set yourself up for the diabetes roller coaster. Major swings, major corrections, over corrections, reactions… when all you really needed to do was take a few minutes to properly deal with the situation up front.

What have you been taught about diabetes as if it were a sacred truth? How many of these 'false idols' have you already discovered? Are they affecting your current diabetes care? Have you managed to replace these idols with something that actually works? Hopefully, the chapters that follow will give you a more effective toolset than myth and misinformation.