

# A BETTER NUTRITION GUIDE TO CONTINUOUS GLUCOSE MONITORS

Your body has nutrient needs to help it run optimally. While all our bodies may need the same nutrients - the amounts, forms, and frequency may differ for each of us, and at different times in our lives. Enter better nutrition as essential for you to get and stay healthy. "Giving your body today, what it needs to run better, while reducing or avoiding what can irritate, overwhelm and disrupt those efforts." This is why any nutrition plan requires personalization - not just once, but ongoing - to help you identify and give your body better nutrition.

As you can see from the timeline, over the decades, practitioners and patients have used different tools to assess blood sugar levels - an important marker of overall health. With the advent of continuous glucose monitors (CGM's), people with diabetes gained a powerful tool for managing their blood sugar and medications. The CGM's showed them how their food and lifestyle choices impact their blood sugars so they could better self-manage their diabetes with or without insulin.

Today, we know the value of better blood sugar levels for all persons. Thus, CGM's are starting to be used in personalized health and wellness.

CGM's are a tool we can use to personalize your nutrition and lifestyle plan; we can use it to assess progress and also to make changes to your plan as life happens and your body's needs change. Keep reading to learn more and then let's discuss how we will use a CGM together for better results.

## What does knowing our blood sugar tell us about our health?

One key element of better nutrition is knowing how your body responds to different foods. Your body wants and works hard to maintain a relatively constant blood sugar level.

When it drops too low (hypoglycemia), it sends you signals; you become tired and hungry. When blood sugar gets too high (hyperglycemia), your pancreas secretes more insulin, bringing blood glucose back down by converting much of the excess sugar to stored body fat.

Many people experience both blood sugar highs and lows, think peaks and valleys, and our goal is to move your blood sugar levels to be more like gentle, rolling hills. Blood sugar levels will continue to change throughout the day. Knowing your blood sugar values can help you feel better on many levels as well as reduce risk of developing pre-diabetes or type 2 diabetes.

When evaluating the CGM tracings, you can see how your body responds to foods. However, another part of the puzzle is understanding how exercise, stress, sleep, and other environmental factors affect your blood sugar levels. Determining patterns is how we start to develop your personalized plan.

### 1908

- Benedict developed a copper reagent for urine glucose, which was used, with some modifications, for more than 50 years.

### 1980s

- Launch of the Dextrometer
- HbA1c standard measure used in clinical practices. meters and strips requiring less blood became available, all at a cheaper price.
- Self-monitoring of blood glucose (SMBG) became the standard of care, especially for patients with type 1 diabetes.
- The National Glycohemoglobin Standardization program established to have all laboratories standardize the HbA1c assessment method.

### 1999

- FDA approves first device for reading blood glucose levels continuously; professional use only

### 2010s

- Technology advancements including data transmission to user's cell-phones and overall accuracy improvements.
- FreeStyle Libre Pro broke ground as the first CGM that requires no fingerstick testing during wear, could be worn for 14 days but data only available when reviewed with the healthcare provider.

### 2017

- The FreeStyle Libre became available for direct use by patients (earlier in other countries).

### Mid 1800s

- Attempts to quantify glucose in the urine laid the foundation for modern diabetes care.

### 1960s

- First epidemiologic study finding elevated sugars had a higher risk of complications upon diabetes diagnosis.
- Ames developed the first blood glucose test strip for physicians' offices, not for home use.
- Early definition of asymptomatic elevated sugars by the World Health Organization.
- Dr. Samuel Rahbar studies led to the discovery of HbA1c

### 2000s

- More CGMs were introduced with rapid improvements in tracking and ease of use.
- International committee was the first to recommend using the HbA1c as a diagnosis of diabetes at 6.5%.

### 2020s

- Direct to consumer companies sell CGM programs to patients without their practitioner. They offer different technology platforms for reviewing data and services including texting with practitioners for support.
- In 2021, the American Diabetic Association changed recommendations to now use CGM Time in Range for diabetes management. The HbA1c will still be the standard measure to predict and help to prevent diabetes.

# BLOOD SUGAR IS ABOUT SO MUCH MORE THAN CARBS! THERE ARE 42+ FACTORS THAT IMPACT BLOOD SUGARS.

Blood sugars vary in each individual's day-to-day; understanding how each factor will impact yours requires wearing a continuous glucose monitor and working together to look for patterns for responses to different items in these key areas:

- Foods & Drinks
- Medications & Supplements
- Activity
- Biological
- Environmental
- Behaviors

## Definitions:

**Blood Sugar (blood glucose):** is the measurement of glucose (a sugar) concentration in the blood.

**Insulin:** a hormone produced in the pancreas by the islets of Langerhans, which regulates the amount of glucose in the blood. Insulin is released after you've eaten a meal and there is glucose in the bloodstream. The insulin transports glucose into the cells for energy; lowering the blood sugar levels in the blood.

**Continuous Glucose Monitor (CGM):** a form of technology that allows you to track your glucose levels at regular intervals throughout the day and night. CGM systems work to sense, transmit, and receive your glucose data.

**CGM Tracings:** glucose patterns that a CGM provides for a given time period

**Fasting Blood Sugar (FBS):** this is a lab test or in hospital to measure blood glucose after you have not eaten for at least eight hours. It is also an at-home test using a finger stick to check blood sugar before and two hours from the start of the to see effects of food (pricking finger - lots).

**Hemoglobin A1C (HbA1c):** glycosylated hemoglobin count is a form of hemoglobin compound to identify the average level of plasma glucose concentration over a 90-day period. Hemoglobin A1C (testing a 3 month average of your blood sugar) is used to diagnose pre-diabetes & diabetes, but does not indicate the daily highs and lows that people have.

**Time in Range:** is the amount of time you spend in the target blood sugar range between 70-180 mg/dl.

**Carbohydrate:** is an organic compound such as sugar or starch, and is used to store energy. Most carbohydrates (fruits, staches and starchy vegetables) get broken down and converted to sugar within 30-90 minutes after eating.

**Sugar: are carbohydrates with one (monosaccharides) or two (disaccharides) sugar molecules. Types of sugar:** fruit sugar (fructose), table sugar (sucrose), and milk sugar (lactose).

**Sweetener:** any of various natural and artificial substances that provide a sweet taste in food or beverage. They may or may not provide calories.

**Interstitial Fluid:** a thin layer of fluid that surrounds the tissue cells below your skin.



## What can a CGM do to help us help you get more health wins?

Evaluate your Time in Range - how often are your blood sugar levels staying in a better range for your body and what triggers your blood sugar to be outside of Time in Range.

Show you how your current digestion, sleep, stress, activity, and other behaviors impact your Time in Range and we can see how improvements you make (like a Digestive Tune Up or increasing / changing activity levels or helping your body address stress) improve your Time in Range.

As you make better nutrition choices for your body, more often, to improve quantity, quality, frequency and nutrient balance - we can see what improves your Time in Range. These might include choices like adding supplements or changing the amount of water or getting in a rainbow of colors or reducing the amount you eat at dinner.

Determine whether fasting or time-restricted eating is better for you personally, throughout the month and in different seasons of the year and of your life. We can use a CGM to help us find what's better for you today.

## How a CGM Sensor works:

CGM blood sugar readings come from the interstitial fluid (ISF), a thin layer of fluid that surrounds the cells of the tissues below your skin, not from your blood. There is a 5 to 15-minute delay in ISF glucose response to changes in blood sugar. Thus, a CGM reading and a blood sugar reading may not match. But CGM readings have been proven to be reliable blood sugar values.

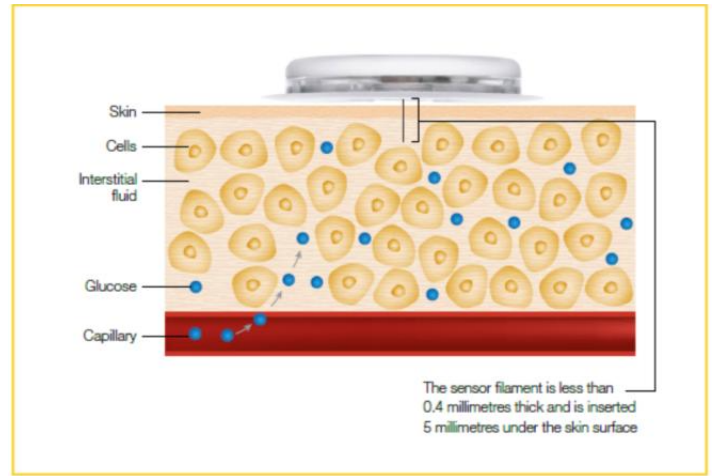


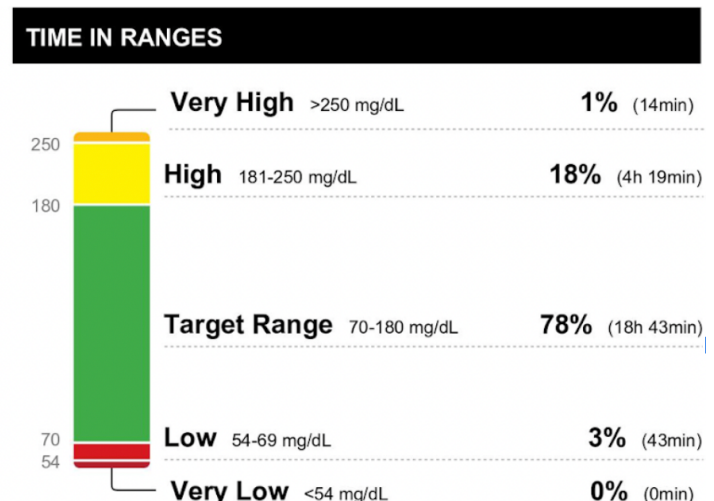
Image from FreeStyle.Abbott

Your CGM can send signals to alert you, and we can discuss specific choices to help you respond better. Here is a sample for FreeStyle's Libre:

FreeStyle Libre System Trend Arrows		
Reader	Glucose Direction	Change in Glucose
↑	Rising quickly	<b>Glucose is rising quickly</b> Increasing >2 mg/dL/min or >60 mg/dL in 30 minutes
↗	Rising	<b>Glucose is rising</b> Increasing 1–2 mg/dL/min or 30–60 mg/dL in 30 minutes
→	Changing slowly	<b>Glucose is changing slowly</b> Not increasing/decreasing >1 mg/dL/min
↘	Falling	<b>Glucose is falling</b> Decreasing 1–2 mg/dL/min or 30–60 mg/dL in 30 minutes
↓	Falling quickly	<b>Glucose is falling quickly</b> Decreasing >2 mg/dL/min or >60 mg/dL in 30 minutes
No arrow present indicates that the system cannot calculate the velocity and direction of the glucose change.		

Sample of a Time in Range (TIR) graph:

GLUCOSE STATISTICS AND TARGETS	
December 7, 2019 - December 20, 2019	14 Days
% Time CGM is Active	97%
Ranges And Targets For Type 1 or Type 2 Diabetes	
<b>Glucose Ranges</b>	<b>Targets</b> % of Readings (Time/Day)
Target Range 70-180mg/dL	Greater than 70%(16h 48min)
Below 70 mg/dL	Less than 4% (57min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h 0min)
Above 250 mg/dL	Less than 5% (1h 12min)
Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.	
<b>Average Glucose</b>	<b>141 mg/dL</b>
<b>Glucose Management Indicator (GMI)</b>	<b>6.7 %</b>
<b>Glucose Variability</b>	<b>31.6%</b>
Defined as percent coefficient of variation (%CV); target ≤36%	



## Frequently Asked Questions and Considerations for Using a CGM:

**Q: Should I buy a CGM online as part of a program I can do myself?**

**A:** These programs can be expensive, and they may or may not include access to a healthcare provider. Additionally, even if they do give you access to a dietitian or nurse or coach, that person does not have your full history. It is unlikely they can help you analyze all the different factors (remember there are 42!) that are impacting your blood sugar results. We can discuss how working together we can use a CGM for more efficient, easier and more effective results.

**Q: Can I just wear a CGM or do I have to keep a food journal?**

**A:** There is a lot that a CGM can tell us about your Time in Range - but we need to know what, why and how your body is responding to things to either be in or to keep you outside of Time in Range. So capturing what you are eating is essential, yes, but you also need to journal other things, as we know there are over 42 factors that impact your blood sugar levels (see our journal page at the end of this guide for an easy tool to use).

**CAUTION: A "Perfect" blood sugar day is not your better health goal.** There are a lot of things you can do to "win" if that is defined as lower blood sugar or more Time in Range, in a day but not all of those are going to deliver you lasting better health. Many CGM programs focus on quick tips to drop your blood sugar or to get you in Time in Range that have you remove amounts

of carbs or avoid foods or change certain behaviors (how much, how long, how intensely you exercise). These may not be sustainable. These can contribute to nutrient insufficiencies (we will work on making sure your choices improve your Time in Range and deliver your body the nutrients it needs). We will review patterns, not specific moments or days to make personalized recommendations.

**CGMs are a way to identify your better carbohydrate choices, along with proteins, fats, and non-starchy vegetables.** We will use your data to personalize the types, amounts, and frequencies of your better choices.

**Q: Can I get a prescription for a CGM without having diabetes?**

**A:** Yes, you can request one from your doctor or nurse practitioner without having diabetes. There are some online services that allow you to purchase a CGM after having a brief consultation with their practitioner to give you clearance for the CGM.

**Q: How often should I change the sensor?**

**A:** Typically you should change the sensor every 14 days, or as needed, but follow the recommendations with the CGM you purchase and ask me for any guidance.

**Q: Can I use a CGM if I have my period?**

**A:** Yes, you can use the sensor with your period. In fact, hormonal shifts significantly impact blood sugar levels, so the week or 10 days before and into your period can be a great time to use a CGM.

**Q: Can we use a CGM with kids?**

**A:** Yes, CGM's are available for children with diabetes ages 4 and above. There may be instances where we want to use a CGM for non-diabetic children.



## References:

1. <https://professional.diabetes.org/sites/professional.diabetes.org/files/media/db201811.pdf>
2. Clarke SF, Foster JR. A history of blood glucose meters and their role in self-monitoring of diabetes mellitus. Br J Biomed Sci 2012;69:83-93

## Contributing Experts:

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**My primary health goal this month is:**

**Yesterday:**

Yesterday my activity included: (Check all that apply)

weight training	bike	running	brisk walking	nothing / mostly sitting	
chasing after kids	walking the dog		HIIT workout	restorative yoga/Tai chi	boxing
hot/high intensity yoga	swimming	other			

Which I did for a total of:      10-20 minutes      30-45 minutes      45+ minutes

Yesterday my digestion was:      normal      off

If off, were you:      constipated      bloated      had loose stools      experienced reflux

I had      bowel movements yesterday  
 please note if they were      foul-smelling      pellets      had undigested food

Last night I:  
 slept well      slept through the night      got up to pee 1+ times      was awakened by something  
 slept poorly      slept for <5 hours      slept for 5-6 hours      slept for >7 hours

Got into bed at      (time)  
 Last looked at any TV, computer or mobile device      (time)

Noticed my bedroom was :      cool      cold      warm      hot      dark      some light      lots of light  
 comfortable      uncomfortable

**Today:**

Today I woke up at      (time) feeling:  
 tired,      stressed      relaxed      recovered      fantastic      in pain      hungry  
 bloated or other digestive complaint      sore

What/who are you grateful for?

What/ who is causing stress?

Pick 3 times today to "check-in" on your stress level and note them here:

Time      How stressed am I (1 not at all -10 extremely stressed)?  
 Time      How stressed am I (1 not at all -10 extremely stressed)?  
 Time      How stressed am I (1 not at all -10 extremely stressed)?

# When you eat or drink today please fill out the following for each "Pit Stop" (this means each time you stopped to take something in):

## Pit Stop #1

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music

## Pit Stop #2

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music

### Pit Stop #3

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music



### Pit Stop #4

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music

## Pit Stop #5

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music



## Pit Stop #6

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music



## Pit Stop #7

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music

## Pit Stop #8

Time you started eating / drinking

Time you stopped eating / drinking

How hungry are you? [scale of 1 not at all to 10 extremely]

How thirsty are you? [scale of 1 not at all to 10 extremely]

What did you eat (estimate amount like a fist or a small bowl etc. as well as include any sauces, spices or condiments you add)?

What did you drink (estimate amount like one can, a small juice glass, a large mug or note the ounces)?

Did you take any medications or supplements during this time?      No      Yes (If yes, list here):

How delicious did you find your choices [1-10 with 1 being awful or tasteless and 10 being sooooo delicious]

When you were eating / drinking were you [check all that apply]:

alone      with friends      preparing food for others      with family      tired      upset      frustrated  
happy      grateful      discouraged,      nervous      watching TV      in the car      on a mobile device  
at home      dining out      working      listening to music

## End of Day

What/who are you grateful for?

What/ who is causing stress?