Addressing Insulin Resistance in Diverse Patient Groups

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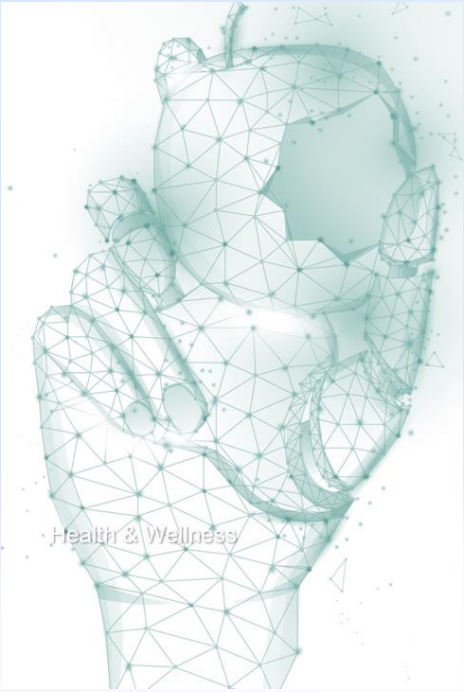
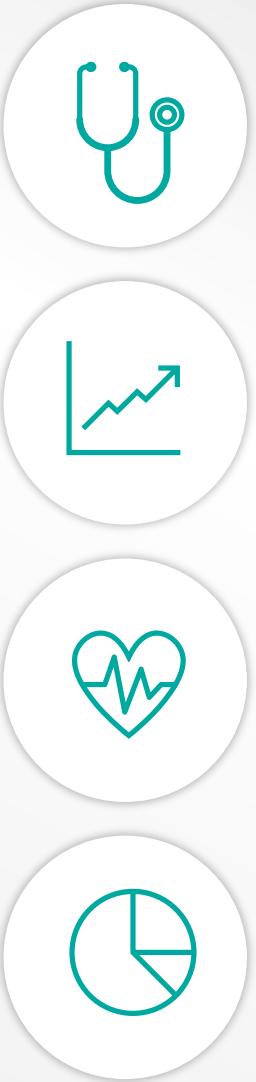


Death From Heart Disease Is On The Rise… Especially in Young Adults

- Heart disease is #1 global cause of death in men and women
- Women: Fastest-growing heart disease death rate is in **middle-aged women 45-64**
- Millennials: Age **25 to 44** saw a nearly 30% increase in heart attack deaths over the first two years of the pandemic
- **Over 90%** of heart disease is due to modifiable risk factors (based on MESA study)



CDC. NVSS. 2019;68(5):1-9. Available at https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_05-508.pdf
Yusuf S, et al. *Lancet.* 2004;364(9438):937-952. Available at https://pubmed.ncbi.nlm.nih.gov/15364185/
AHA Newsroom. January 27, 2021. Available at https://newsroom.heart.org/news/heart-disease#:~:text=Heart%20disease%20remains%20the%20%231,from%20the%20American%20Heart%20Association Accessed February, 2024.
Yeo YH, et al. *J Med Virology.* 2023;95(1):e28187. Available at https://onlinelibrary.wiley.com/doi/10.1002/jmv.28187

Talk Overview

- Carb traffic diagram to explain insulin resistance
- Ethnic differences in risk and metabolism
- Using CGMs to personalize nutrition for diverse patients
- Key nutrition principles to address insulin resistance

Insulin Resistance: A Carbohydrate Parking Problem

Muscle Resistance

- Can't clear glucose (pass not accepted)
- Inactive (no demand)
- High carb intake (no parking)

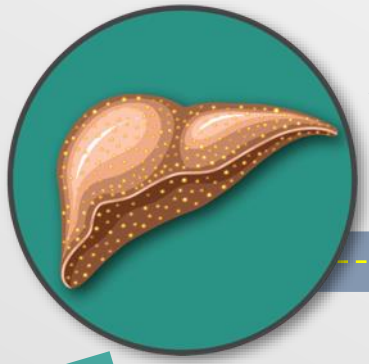
- A1C, Fasting Glu, CGM

- Waist-to-height ratio
- Body weight/BMI

CARBS

Consistent & Personalized dietary advice

Fat storage in liver (fatty liver)



Fat released by liver into blood (high triglycerides)

Fat Storage

- Weight gain
- Inflammation
- Worsening insulin resistance
- Fatigue

- Liver tests (AST, ALT)

- Fasting lipid test

From Book, Sinha R. *The South Asian Health Solution.* Oxnard, CA: Primal Blueprint Publishing; 2014. p 100.

Risk Factors for Insulin Resistance

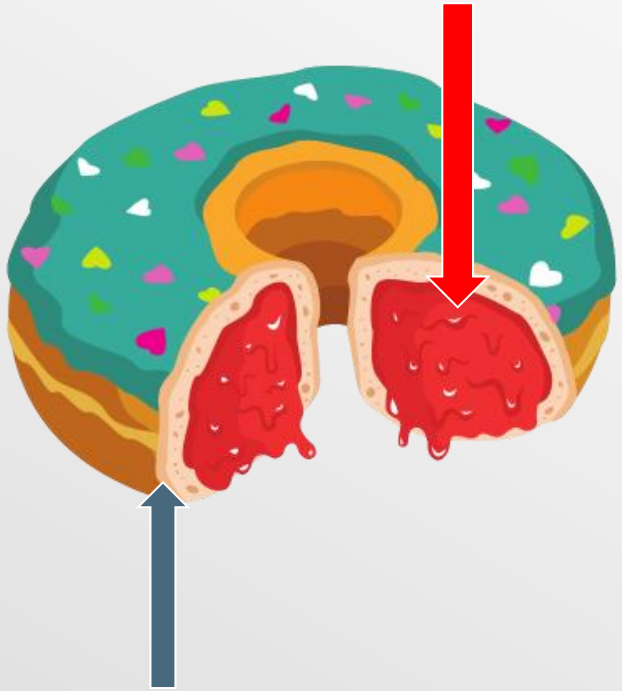
Increased Waist Circumference	Waist-to-height and waist-to-hip ratio
High triglycerides	>/= 150 mg/dL (aim for <100 mg/dL)
Low HDL	<40 mg/dL if male, <50 mg/dL if female
Elevated Blood Glucose	Fasting glucose > 100 mg/dL and/or A1C test >5.6%
High Blood Pressure	>130/85
At Risk Conditions	Gout, fatty liver, PCOS, acanthosis nigricans, gestational diabetes
High Risk Ethnicities	South Asian, Hispanic/Latino, Filipino, Pacific Islander, Native Americans

Gerald Reaven

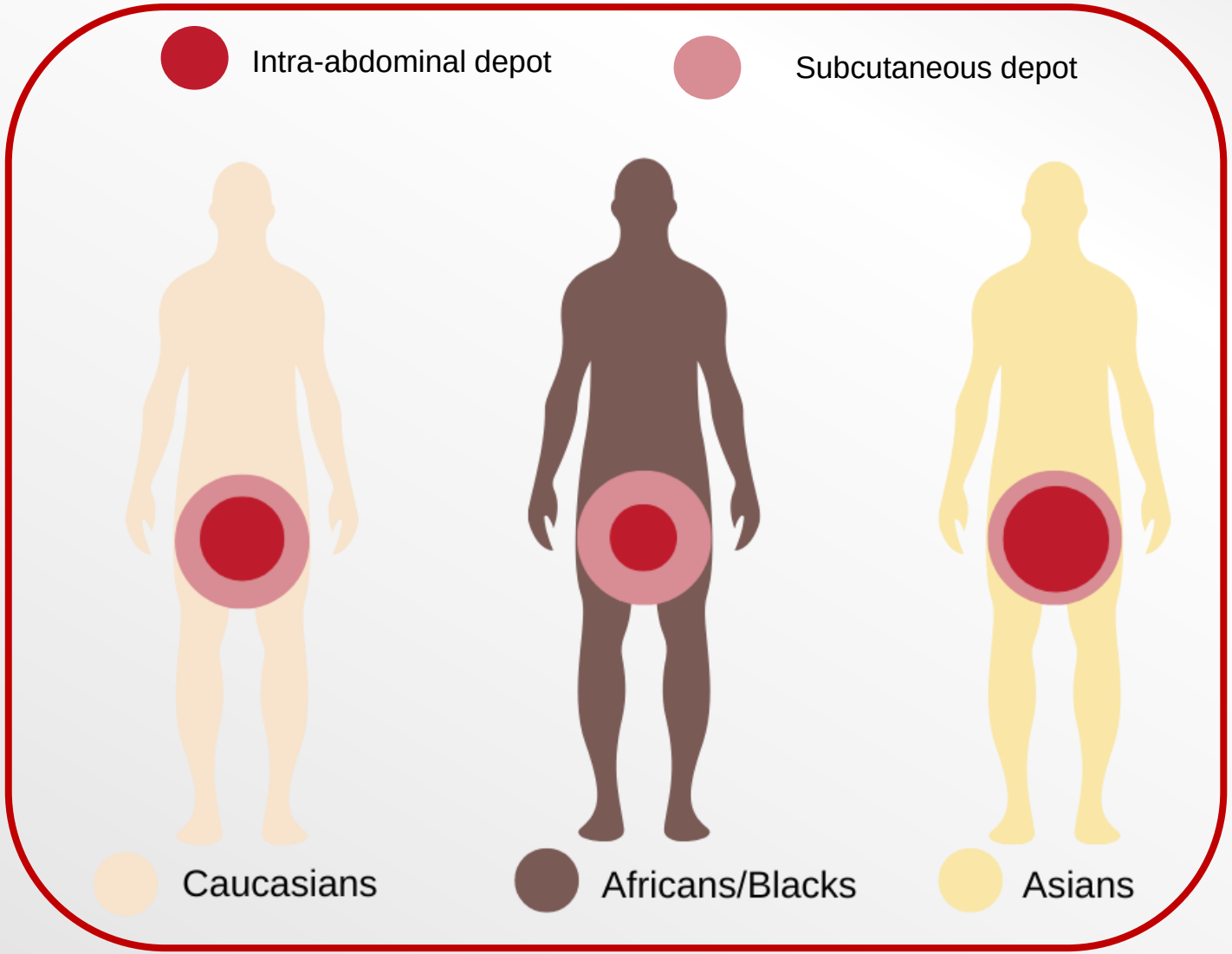
* CGM tracks well with most of these risks: blood glucose, waist circum, trigs, HDL

Visceral Fat and Ethnicity

Visceral "Inflammatory" Body Fat

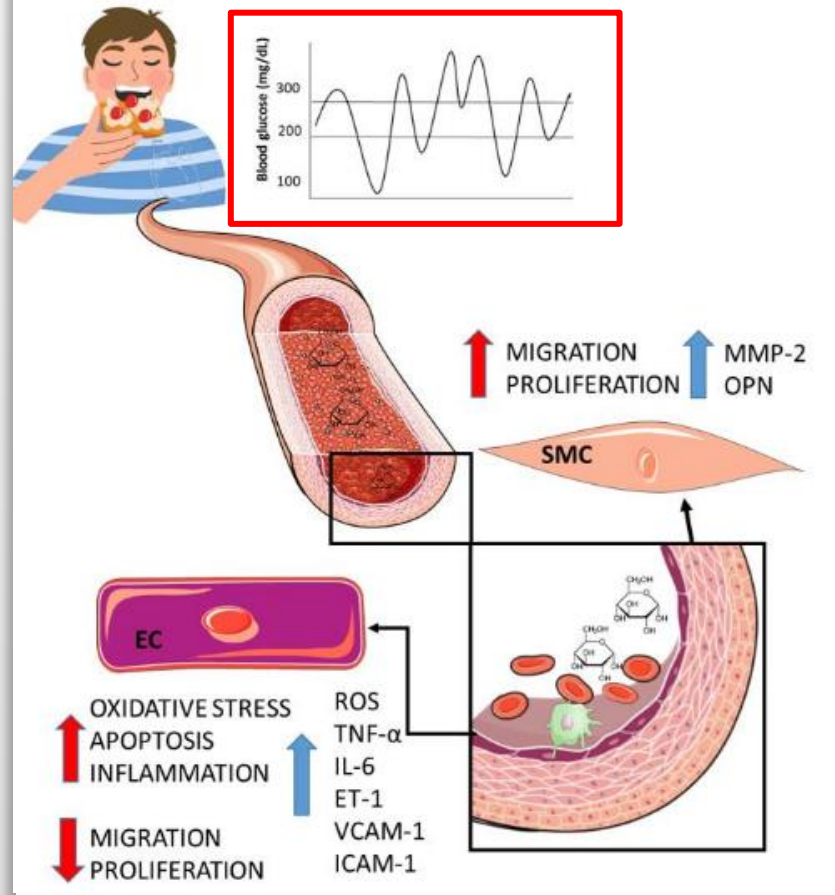


Subcutaneous Body Fat



Glucose Variability and Heart Disease

Biological Mechanisms



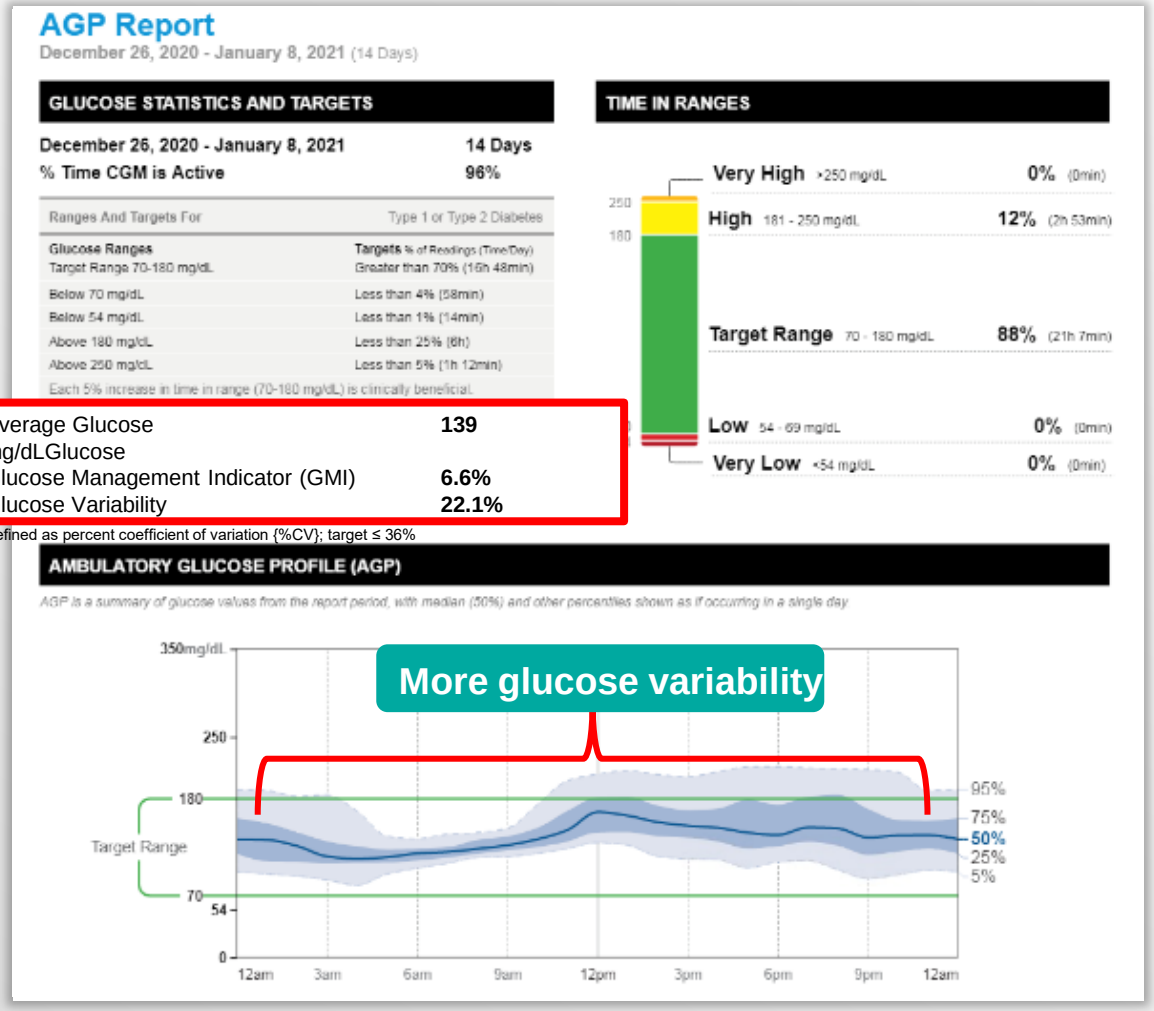
Clinical Consequences

- Heart, brain and blood vessel issues
- Abnormal heartbeat
- Heart attack
- Heart and kidney damage after coronary stenting
- Artery damage
- Poor short-term outcomes after CABG and TAVI
- Risk of coronary plaque
- Artery lesions
- Narrowing of the heart's aortic valve

Alfieri V, et al. Int. J. Mol. Sci. **2021**, *22*(16), 8393; https://doi.org/10.3390/ijms22168393

CGM Dashboard

Patient Data



AGP Report

December 26, 2020 - January 8, 2021 (14 Days)

GLUCOSE STATISTICS AND TARGETS

December 26, 2020 - January 8, 2021	14 Days
% Time CGM is Active	96%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges Target Range 70-180 mg/dL	Targets % of Readings (Time/Day) Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

TIME IN RANGES

Very High	>250 mg/dL	0%	(0min)
High	181 - 250 mg/dL	12%	(2h 53min)
Target Range	70 - 180 mg/dL	88%	(21h 7min)
Low	54 - 69 mg/dL	0%	(0min)
Very Low	<54 mg/dL	0%	(0min)

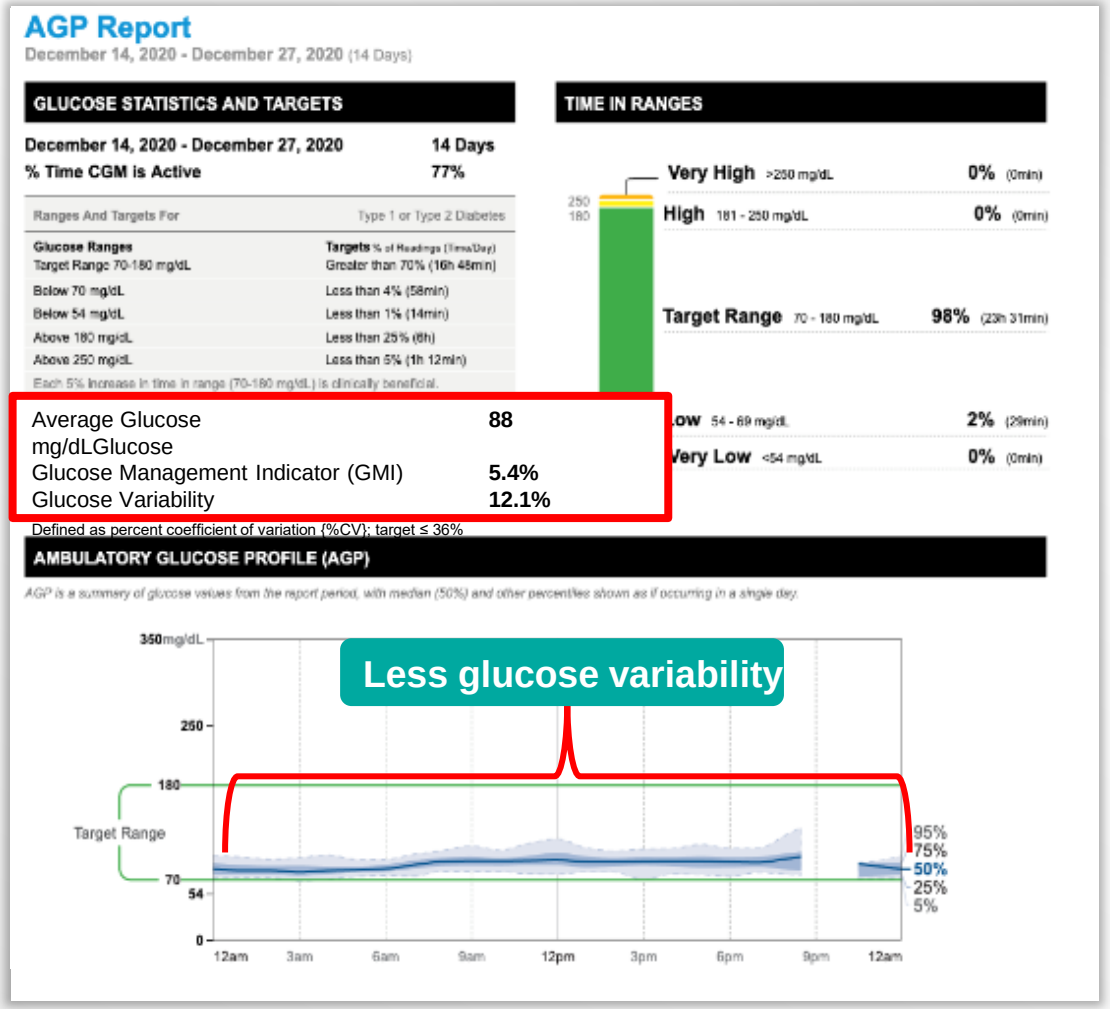
Average Glucose mg/dLGlucose	139
Glucose Management Indicator (GMI)	6.6%
Glucose Variability	22.1%

Defined as percent coefficient of variation {%CV}; target ≤ 36%

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.

Optimal Metabolic Data



AGP Report

December 14, 2020 - December 27, 2020 (14 Days)

GLUCOSE STATISTICS AND TARGETS

December 14, 2020 - December 27, 2020	14 Days
% Time CGM is Active	77%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges Target Range 70-180 mg/dL	Targets % of Readings (Time/Day) Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
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TIME IN RANGES

Very High	>250 mg/dL	0%	(0min)
High	181 - 250 mg/dL	0%	(0min)
Target Range	70 - 180 mg/dL	98%	(23h 31min)
Low	54 - 69 mg/dL	2%	(29min)
Very Low	<54 mg/dL	0%	(0min)

Average Glucose mg/dLGlucose	88
Glucose Management Indicator (GMI)	5.4%
Glucose Variability	12.1%

Defined as percent coefficient of variation {%CV}; target ≤ 36%

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.

Practical Tip: Focus on First Meal Satiety

- Increase first meal (aka breakfast) protein. Most individuals get <10-15 grams…aim for at least 30 grams
- More fiber with first meal
- Find the optimal dose that keeps you full for at least 3-4 hours.
- We consistently see more stable glucose patterns, reduced hunger, and improved energy in patients throughout the day with adequate first meal protein

Carb “Copycats”

Cauliflower Rice

Zucchini Pasta/Noodles

Spaghetti Squash

Shredded Cabbage

Miracle Noodles or Miracle Rice
(Shirataki Noodles)

Lettuce Taco Wraps

"CARBS" Approach to Nutrition

THE "CARBS" APPROACH FOR SOUTH ASIANS

The major fat-promoting CARBS:

- **C** = **Chapatis:** Includes all Indian flatbreads, and breads in general, even those made from wheat
- **A** = **Aloo:** Includes mainly potatoes and other starchy vegetables (peas, corn, winter squashes)
- **R** = **Rice:** Includes rice and grains (barley, millet, semolina, sorghum, etc.)
- **B** = **Beans:** Includes lentils, chickpeas, and kidney beans
- **S** = **Sugar:** Includes syrup and assorted sweet-tasting foods and beverages

NC = TOTAL GRAMS CARB – TOTAL GRAMS FIBER

Bargain Foods ($) = Low NC and maximal nutrients in return (vegetables, nuts, seeds, etc.)

Expensive Foods ($$$) = High NC and little to no nutrients (white rice, noodles, flour, etc.)

From Book, Sinha R. *The South Asian Health Solution.* Oxnard, CA: Primal Blueprint Publishing; 2014.

Recommendations for Nutritional Noncompliance

- **Avoid dietary deprivation**: extreme fasting, very low carb/keto,100% plant-based for someone who enjoys meat/fish, etc.
- **Small dietary tweaks** while monitoring glucose response lead to big changes over time
- **Food experiments** help individuals decide what to stock in their fridge and pantry
- Above is **not a diet**, but simple and sustainable modifications aligned to individual preferences

4 Nutrition-Glucose Lessons from Our Metabolic Program

1. Daily **carbohydrate tolerance** is highly variable among individuals.

2. The **glucose response** to individual foods is highly variable.

3. As metabolism improves, some restricted foods may become acceptable foods

4. Afternoon "**glucose dipping**" is a common phenomenon that drives overeating and mood instability.

CGM's Potential Role in Diverse Groups

Examining a Continuous Glucose Monitoring Plus Online Peer Support Community Intervention to Support Hispanic Adults With Type 2 Diabetes: Protocol for a Mixed Methods Feasibility Study

Ng AH, Greenwood DA, Iacob E, Allen NA, Ferrer M, Rodriguez B, Litchman ML. Examining a Continuous Glucose Monitoring Plus Online Peer Support Community Intervention to Support Hispanic Adults With Type 2 Diabetes: Protocol for a Mixed Methods Feasibility Study. JMIR Res Protoc. 2022 Feb 24;11(2):e31595. doi: 10.2196/31595. PMID: 35200153; PMCID: PMC8914754.

Multimodal digital phenotyping of diet, physical activity, and glycemia in Hispanic/Latino adults with or at risk of type 2 diabetes

Amruta Pai, Rony Santiago, Namino Glantz, Wendy Bevier, Souptik Barua, Ashutosh Sabharwal & David Kerr

npj Digital Medicine **7**, Article number: 7 (2024) | Cite this article

POSTED IN: **RICE NEWS** > **Current News** > **2021**

Wearable glucose monitors shed light on progression of Type 2 diabetes in Hispanic/Latino adults

Souptik Barua, Ashutosh Sabharwal, Namino Glantz, Casey Conneely, Arianna Larez, Wendy Bevier, David Kerr. Dysglycemia in adults at risk for or living with non-insulin treated type 2 diabetes: Insights from continuous glucose monitoring. EClinicalMedicine, 2021; 35: 100853 DOI: 10.1016/j.eclinm.2021.100853

Sushi Tolerance Test with a Glucose Sensor

Before

Time	Glucose
0 (baseline)	95 mg/DL
30 min	120 mg/dL
60 min	185 mg/dL
90 min	212 mg/dL

After

Time	Glucose
0 (baseline)	102 mg/DL
30 min	115 mg/dL
60 min	153 mg/dL
90 min	107 mg/dL

Glucose Dipping Affects Mood and Energy

32 minutes → 72 point glucose drop!

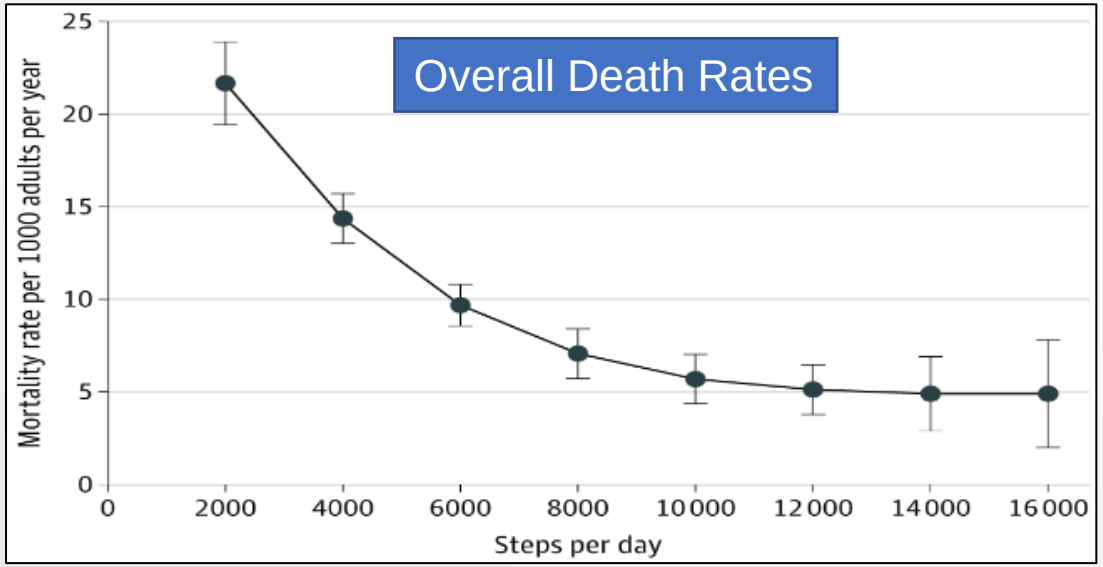
Impact of high glycemic food on a workaholic patient

Matching Carb Intake to Activity Levels

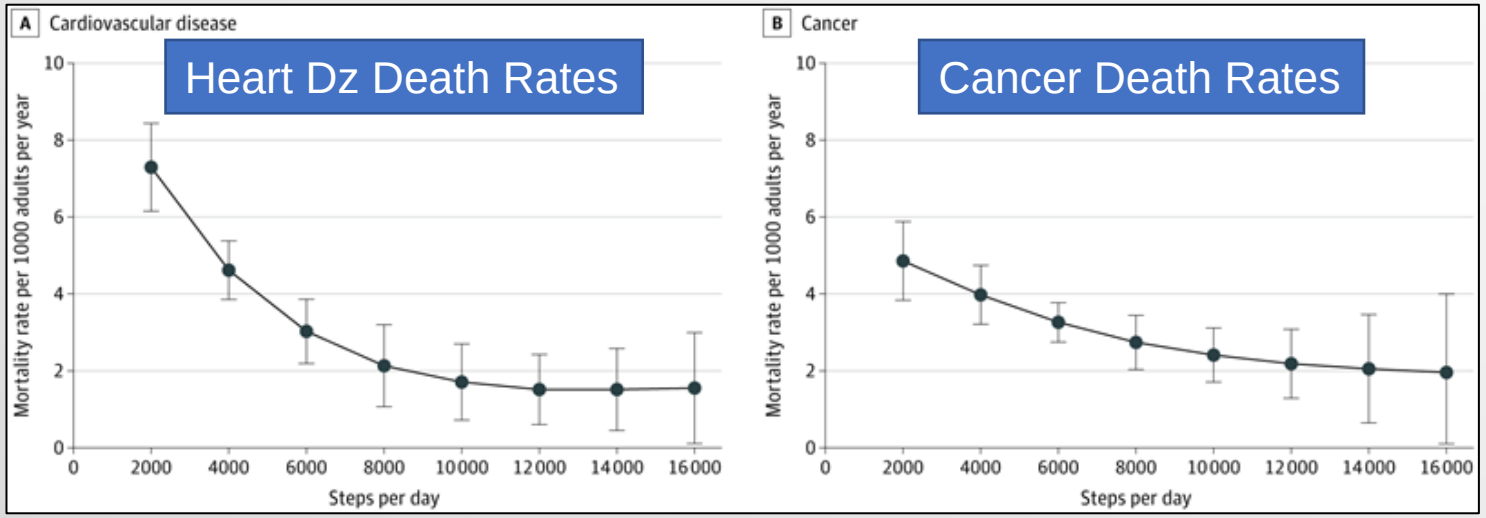
30,000+ steps daily
Strong leg and core
Normal Vitamin D
Higher Carb Ok

< 5,000 steps daily
Weak leg and core
Low Vitamin D
Higher Carb not OK

Daily Steps and Death Rates



- 8-10,000 daily steps is sweet spot
- Abrupt increase in risk below 6,000



Saint-Maurice PF, et al. *JAMA*. 2020;323(12):1151-1160. doi:10.1001/jama.2020.1382

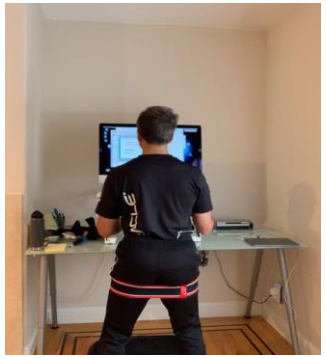
NEAT Can Burn Serious Calories

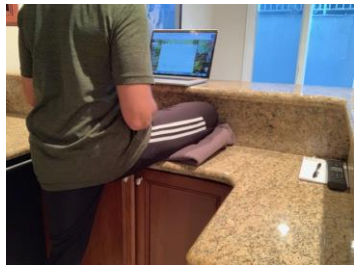
- **NEAT** (**N**on **E**xercise **A**ctivity **T**hermogenesis) varies among individuals and can account for a difference of up to **2000 kcal** burned per day

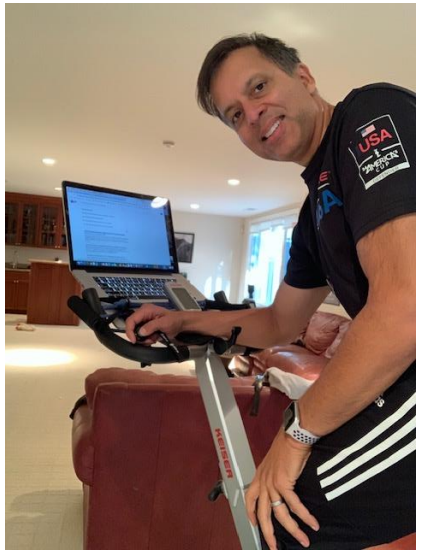
- "Obese individuals have an innate tendency to be seated for **2.5 hours more** than sedentary lean counterparts."

Levine JA, et al. **Non-Exercise Activity Thermogenesis.** ATVB. 2006;26(4). Available at https://www.ahajournals.org/doi/10.1161/01.atv.0000205848.83210.73

Exercise Snacking: Stock, Visit, and “Snack” on Movement







EXERCISE PANTRY

1. **STOCK** your own pantry with a variety of movements and exercises

2. **VISIT** this pantry at least every 30-45 min

3. **SNACK** (on activity) for at least 5 min

Lifts, Squats and Carries (Compound Lifts)

Muscle Resistance

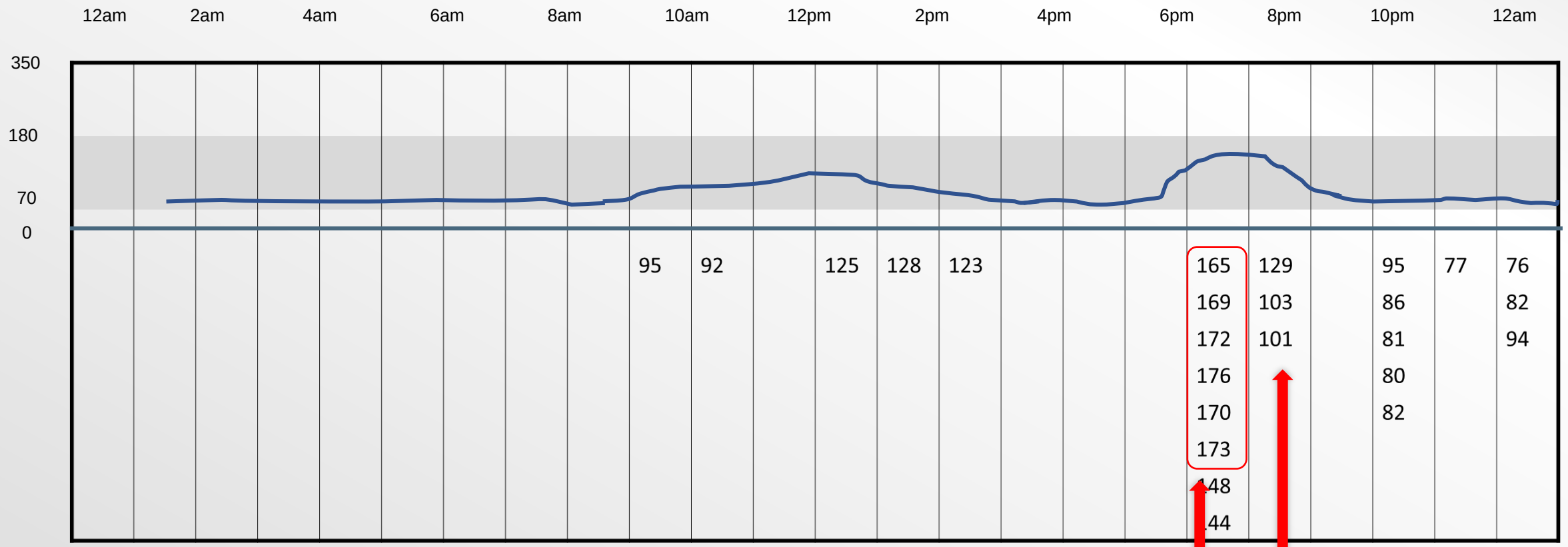
- Can't clear glucose (pass not accepted)
- Inactive (no demand)
- High carb intake (no parking)

Dumbbell/Barbell Lifts

Sumo squat

Weighted walks and carries

The Stress Effect: In-Laws vs Chocolate Cake



Metabolic Wellness Program (MWP)

8 Week Virtual Health Education Program

ONBOARDING/SET-UP (Weeks 1-2) ***DISCOVER (Weeks 3-5)*** ***OPTIMIZE (Weeks 6-8)***

Registration

CGM Prescription

Pharmacy team prescribes **2 sensors** to pharmacy of choice

Virtual Group Education Session

Virtual Group Education Session

Virtual Group Education Session

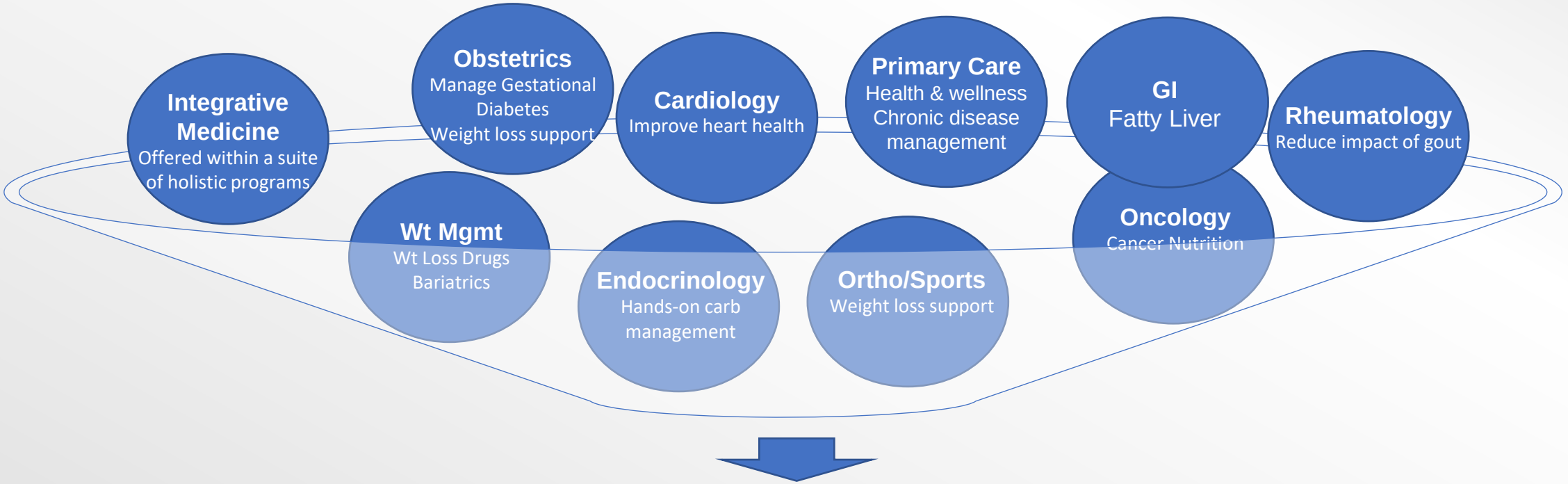
PAMF's leading experts in lifestyle, nutrition, and holistic health offer tailored education and interactive Q&A

Wellness Navigators guide participants to integrative/holistic, primary care and specialty resources

You will apply the first CGM. You'll get a feel for how to use the app & take notes in the journal

Education and tools are provided to help interpret glucose data and tailor lifestyle changes to optimize blood sugar and overall health

Specialty Referrals



Referral Pool for the Metabolic Wellness Program

Analysis underway to estimate total referral base

Expanding the Nutritional Formulary

Prescriber's Principles

- Right med for right patient
- Right dose to achieve intended outcome
- Right dose to minimize side effects
- Right dose to encourage compliance
- Combination meds when necessary
- Adjust med dose as needed

*Need to apply similar principles when prescribing nutrition.

*Current guidelines provide a limited dietary formulary for individuals who are metabolically and culturally diverse