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Adherence to an AI-Based Lifestyle Management Software for a Patient with Severe Metabolic Disorder Conditions (Section 2 of ebook Preface) (No. 992)

Gerald C. Hsu*

eclaireMD Foundation, USA

Information

This article is a continuation of the author's paper number 946: Preface of eBook: Preventive Medicine: Wellness Beyond Diabetes (Section 1: No.946, 10/25-26/2923)

Abstract

As an advocate for preventive medicine and a firm believer in scientifically-backed lifestyle management, the author shares his approach to his health improvement and well-being.

Emphasizing the importance of medical research, not only as a career but as his sole passion in his senior years, he underscores the belief that "life is the most precious aspect of existence." He advocates for every individual's right to lead a life that is healthy, joyous, and filled with purpose, starting from the outset.

Keywords: Viscoplastic; Diabetes; Glucose; Sleep; Lifestyle; Dementia

Abbreviations: CGM: continuous glucose monitoring; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; SD-VMT: viscoelastic medicine energy theory

Article

As an advocate for preventive medicine and a firm believer in scientifically-backed lifestyle management, the author shares his personal approach to improving health and wellbeing.

Emphasizing the importance of medical research, not only as a career but as his sole passion in his senior years, he underscores the belief that "life is the most precious aspect of existence." He advocates for every individual's right to lead a life that is healthy, joyous, and filled with purpose, starting from the outset.

The author begins his day by logging vital biomarkers into his personalized AI software, Chronic, on his iPhone 13 immediately after waking up. These morning tasks of biomarker measurement include fasting plasma glucose (FPG), systolic and diastolic blood pressure (SBP and DBP), heart rate (HR), body temperature (BT), and finger oxygen saturation levels (finger O2). The monitoring of oxygen saturation levels in his finger began on August 8, 2021, due to his concerns about a potential COVID-19 infection affecting his lungs. The collection of all other biomarker data had started between 2010 and 2013.

Notably, the author's medical research work is largely focused on "metabolism", which plays a substantial role in many medical complications involving various internal organs. Metabolism, encompassing all the biochemical processes within living organisms, significantly impacts overall health and can influence a wide range of medical conditions. Additionally, there are other medical complications resulting from weakened "immunity", leading to notable effects of virus or germ infections on some human organs, particularly the respiratory system, such as COVID-19 to the lungs.

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*Corresponding author: Gerald C. Hsu, eclaireMD Foundation, USA

He also meticulously recorded other health metrics: his fasting body weight (in kg or lbs) in the early morning, muscle mass (in kg or lbs), body fat percentage, and visceral fat percentage. Using these data, he calculated two crucial ratios: muscle mass to body weight, and visceral fat to overall body fat.

For example, between August 11, 2023, and December 11, 2023, he maintained a muscle-to-body weight ratio of 78%, indicating good muscle mass. His average belly fat was 16% and his total body fat was 18%. This results in a belly fat to total body fat ratio of 88%. This suggests his minimal subcutaneous fat, but also raises concerns due to the high proportion of belly fat, which constitutes 88% of his total body fat. This is notable, especially considering that his overall body fat percentage is a relatively healthy level of 18%. Such a high visceral fat level suggests a health risk of non-alcoholic fatty liver diseases (NAFLD) and even potentially liver cancer. Therefore, he engaged a professional trainer to guide him in intensive resistance training while minimizing possible injury risks. His goal is more focused on reducing visceral fat rather than muscle building. The attached diagram shows his annualized average body weight (BW in lbs) and waistline (in inches) between 2010 and 2023.

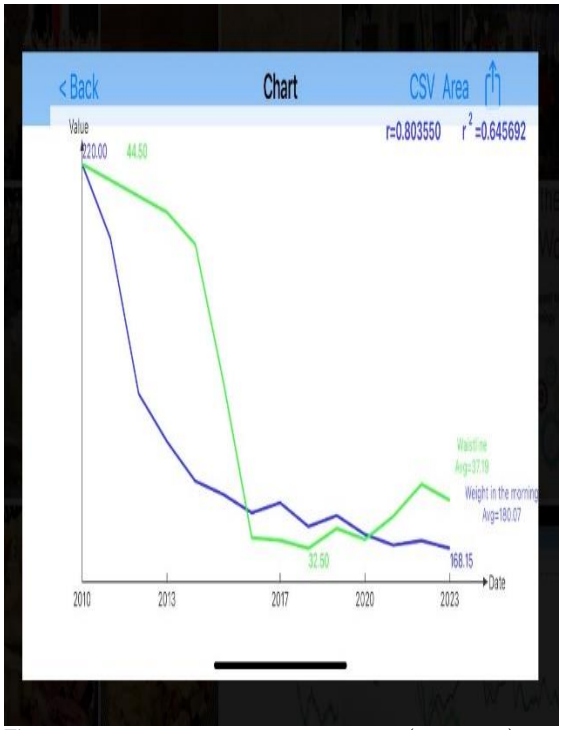


Figure 1. Annualized average body weight (BW in lbs) and waistline (in inches) between 2010 and 2023.

Regarding his morning fasting plasma glucose (FPG) readings, he obtained his data using either the finger-prick method or a continuous glucose monitoring (CGM) sensor-based glucose tracking system. Notably, his single FPG reading upon waking up aligns closely with the average of 28 readings taken during 7 hours of sleep, as recorded by a CGM sensor. For instance, over a period of 5.5 years from May 1, 2018, to December 11, 2023, his average wake-up finger-pierced FPG value was 100 mg/dL, compared to an average of 102 mg/dL from 28 nightly CGM sensor readings over 7 hours. Pathophysiologically, FPG is a crucial biomarker for diabetes, indicating the health state of pancreatic beta cells and their insulin production. Insulin resistance is associated with various metabolic disorders related diseases and complications, as we have learned.

The author has also developed a predicted FPG (fasting plasma glucose) equation using six influential factors, achieving 100% prediction accuracy with a 99.9% waveform correlation using data recorded between 7/1/2015 and 12/11/2023. In addition, he has also formulated a body weight prediction equation with four key influential factors, i.e. food portion, water intake, bowel movement amount, and sleep score, as described below:

Predicted BW in the early morning

= Yesterday's BW in early morning

+ Yesterday's food quantity (m9a)

+ Yesterday's H2O drinking (m6)

- Yesterday's bowel movement / 4

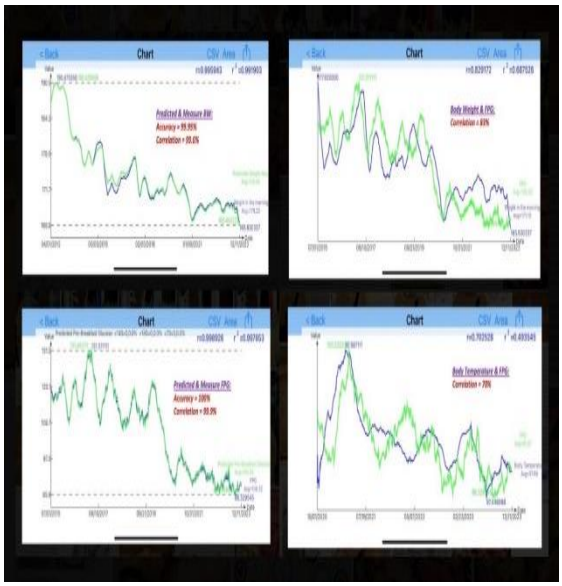
- Last night's sleeping hours / 6

His predicted and measured body weight results have demonstrated a 99.95% prediction accuracy and 99.6% waveform correlation.

Furthermore, he has integrated his AI-based prediction equations for both body weight and FPG into his Chronic AI software on his iPhone device for his daily use. In real-life practice, having accurate prediction capability allows for the alteration of daily life details before damage occurs.

His measured body temperature and his FPG have found to have a high waveform correlation of 70% over a shorter period of 3 years from 10/1/2020 to 12/11/2023. However, his measured body weight and his FPG have found to have a higher waveform correlation of 83% over a much longer period of 8.5 years from 7/1/2015 to 12/11/2023. These indicated a close relationship exited between BW and FPG,

as well as BT and FPG. It seems that correlation between BW and FPG is more reliable due to a longer period of collected data. Therefore, his 14-year health recovery program started from his body weight reduction. Initially, he weighed 220 lbs (100 kg) with a 32 BMI in 2010. Presently, he weighs 165 lbs (75 kg) with a 24.48 BMI as of 12/11/2023. This 55 lbs (25 kg) weight reduction has brought his average glucose levels down from 280 mg/dL (A1C 11%) to 100 mg/dL (A1C 5.9%) without the use of any medications.



The fasting plasma glucose (FPG) level is a critical indicator for evaluating the insulin resistance state of pancreatic beta cells. It also serves as a key benchmark for comparing other glucose measurements taken throughout the day. In a similar vein, the postprandial plasma glucose level (PPG or post-meal glucose), which assesses glucose levels after eating, is shaped by a myriad of factors. It not only builds on the FPG baseline but is also influenced by other 22 distinct elements. Notably, the dietary quality and quantity, especially carbs and sugars intake amount, play a significant role which contributes to the rise of the PPG wave above the FPG baseline. Moreover, activities like post-meal walking can markedly diminish the peak of the PPG wave. These two aspects exemplify the opposing effects on post-meal glucose readings. His observations highlight that beginning post-meal exercise, like walking, is most beneficial 60 minutes after starting a meal. An optimal exercise duration is approximately 45-60 minutes.

Using his background in applied mathematics, physics and various engineering acquired from six different universities, the author developed a Linear Elastic Glucose Theory (LEGT) model to predict his postprandial glucose levels and integrated this LEGT theory into his AI software.

Predicted PPG = FPG in early morning * GH.f + Carbs/sugar grams * GH.p - k-steps of post-meal walking * GH.w

Where, GH.f, GH.p and GH.w, are three modification factors (similar to Young's Modulus in linear elasticity) which are based on individual patient's body conditions and disease status.

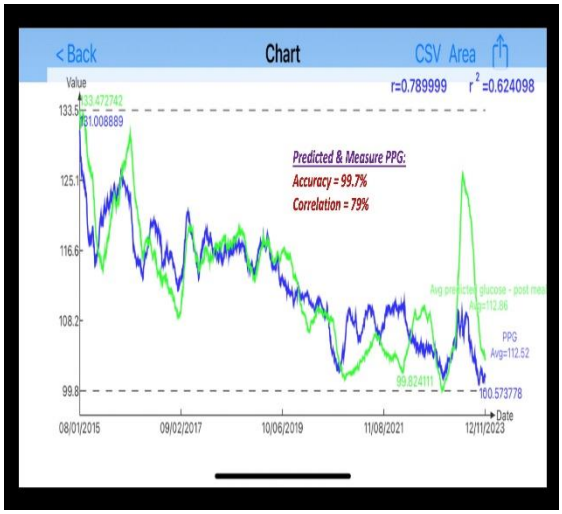
The comparison between his measured and predicted PPG shows a significant waveform correlation of 79% and a prediction accuracy of 99.7%, over 8.5 years, from August 1, 2015, to December 11, 2023. His predicted PPG's accuracy (99.7%) is almost as high as his predicted FPG's accuracy (100%). However, his PPG's correlation (79%) is notably less than that observed in his FPG (99.9%) which can be attributed to the difference in number of influential factors. The PPG is influenced by 22 factors, while the FPG is influenced by only 6 factors. It is noted that the LEGT (Linear Elastic Glucose Theory) predicted PPG by considering only 3 key factors (FPG, carbs/sugar, walking steps) of its 22 influential factors.

Determining the carbohydrate and sugar content in each meal is a challenging and complex task. Traditionally, one would learn about food nutrition for many years and then remember the carbs/sugar contents in various food ingredients. However, this method can be tedious and difficult. The author overcomes this challenge by combining optical physics theory and artificial intelligence techniques in his AI software, Chronics. He discovered that every food material has a unique, dominant color, characterized by specific wavelength, frequency, and amplitude of this color's optical wave. These three attributes reflect the inside molecular structures of food components like carbohydrates, sugar, sodium, etc.

The AI analysis process then begins with the author taking a photo of his meal using an iPhone, for instance, his present iPhone 13 device, which captures images with about 12.2 million pixels. This high-resolution data

allows for conducting a precise color analysis. At first, he created a comprehensive database which incorporates 6 million nutritional data entries from the Department of Agriculture of the U.S. government and numerous nutrition tables from 3,000 US chain restaurants from public Internet space. By developing a special algorithm that correlates the billions of pixels in his iPhone photos with this extensive nutritional database, his developed AI software can quickly estimate the carbohydrate and sugar amount of each meal.

Furthermore, he utilizes his developed LEGT-predicted PPG equation to forecast his Postprandial Plasma Glucose (PPG or post-meal glucose) level before starting his meal. If the predicted PPG value is too high, for example, greater than 140 mg/dL), he then modifies his meal portion and takes another photo, resulting in a new PPG estimate. This innovative optical physics and AI method helps him effectively manage his glucose levels with a prediction accuracy above 99%.



Regarding exercise, he adopted moderate-paced walking (about 100 steps per minute) as his primary exercise regimen, consistently walking 15,000 to 18,000 steps daily (approximately 10-12 km or 6-7.5 miles) and over 4,000 steps after each meal for the past 14 years. This routine has significantly boosted his health, underscoring the importance of perseverance. Given his seniority (77 years old), he prioritizes preventing falls and injuries. Thus, he selects secure environments for his walks, such as strolling in an empty shopping mall early in the morning before shops open, walking inside large stores like Walmart at noon to escape the heat at noon time, and enjoying evening walks along the seaside or beach. Recently, to further trim his belly fat, he incorporated intensive resistance training with gym equipment, guided by a professional trainer. It is also noteworthy that he has participated in 5K or 10K marathons in various cities around the world, including Abu Dhabi, Melbourne, San José, and Honolulu, five times between the ages of 70 (the year 2017) and 76 (the year 2023). He has meticulously recorded all his walking steps, both daily and specifically within two hours after each meal, in his AI software. This allows him to analyze the impact of each post-meal exercise session on his individual PPG waveforms.

Recognizing the importance of exercise, he opts to reduce his time spent in a seated position when possible. Additionally, he has incorporated Tai Chi into his routine to enhance body balance and joint flexibility.

During his years as an entrepreneur and CEO of a successful high-tech company in Silicon Valley, he routinely worked 16-17 hours a day with continuous business challenges and stress, resulting in only 4-5 hours of sleep each night. This chronic lack of sleep led to multiple cardiovascular health issues. However, after selling his business and leaving Silicon Vally behind to focusing on saving his own life through his medical research work, he has improved both the quantity and quality of his sleep. Now at age of 77, he enjoys 8 hours of sleep nightly. His health improvement journey wasn't without challenges, as he also battled a bladder infection for two years due to his severe type 2 diabetes and kidney issues, leading to frequent nightly urination (4 to 5 times each night) and disrupted sleep which further damaged his overall health. Thankfully, this has now reduced to less than once a night in average. His AI software for sleep category includes 16 inputs, such as dream intensity, headaches, pre-sleep worries, bedroom conditions (both temperature and moisture), and skin irritation due to both low moisture and diabetes, etc. His AI software retains a memory of his input data and analysis results, enabling it to predict and automatically adjust most input values with high accuracy to avoid excessive or redundant manual data-entry task.

Hydration plays a crucial role in his daily life, as he ensures to consume 3,000 cc of water daily. His daily life routine involves meticulous tracking of his water intake, sleep

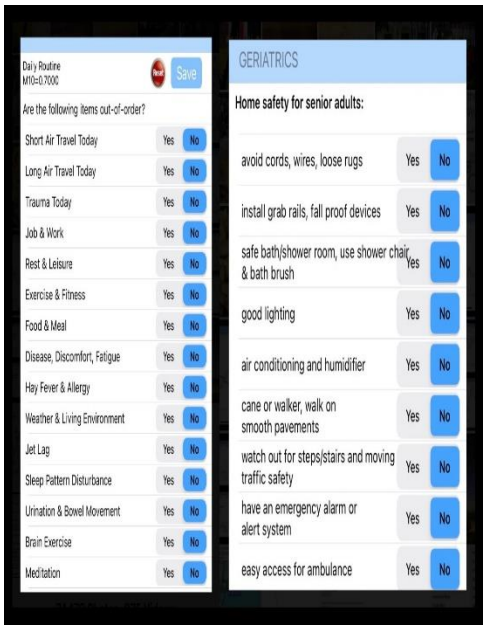
quality, stress levels, physical activity, diet, and bowel movements, striving for a stable daily routine pattern. Bowel movement volume is recorded in percentages (0%, 20%, 40%, 60%, 80%, 100%), where 0% signifies constipation. In the last 4 years, he has dealt with diabetic constipation, which is not only annoying but also has affected his weight predictions and sleep quality. To maintain his overall health, he takes proactive steps to prevent illnesses as much as possible including virus-induced infectious diseases via necessary vaccinations. His daily life routines checklist has included 15 items, emphasizing his commitment to his well-being as much as possible.

As of July 2019, at the age of 72, he began self-studying geriatrics and longevity. He developed an estimated health age equation as follows:

Health Age = Real Biological Age * (1 + ((MI - 0.735)/0.735)/2)

Here, "MI" refers to the daily "metabolism index" value, which combines four metabolic disorders and six lifestyle details, consisting of over 500 detailed elements.

When he was 63 in 2010, his estimated health age was 75. Now, in 2023, although his biological age is 76, his estimated health age has decreased to 63. As a senior, he also uses his AI software that monitors 9 specific geriatric and longevity factors (refer to the table provided below).



The stress monitoring system devised by the author includes two major categories: 19 items targeting individuals without psychological disorders and 15 items for those with such disorders, totaling 34 stress input items. The author, an autodidact in abnormal psychology and personality disorders, has founded five psychotherapy centers during 2012-2010, assisting over 200 abused women and abandoned children. This unique experience has enriched his understanding in this field. (Notably, he exhibits no signs of personality disorders or psychological issues). Since retiring from his high-tech semiconductor business activities, his stress levels have remained remarkably low, just around 50% to 55%, where 50% signifies a "stress-free" state. For the past 14 years, he has dedicated 11 to 12 hours daily to his medical research, a routine that surprisingly does not elevate his stress at all. This is attributed to his motivation being unrelated to fame, power, wealth, or competition. Free from job-related complications, superior or coworker issues, or pressing deadlines, his stress level consistently stays between 50% to 55%, paralleled by an average satisfaction level above 95%, indicating exceptionally low stress.

The author compares maintaining good health to the stability of a table supported by four legs: diet (including hydration), exercise, sleep, and stress. This simple analogy helps him in understanding and remembering the 4 fundamental aspects of his health. Each "leg" contains intricate details, and consistency in practicing these four aspects is crucial. The author emphasizes daily life routine despite certain challenges he had faced, such as frequent travel, averaging a flight every 13 days over the last three decades (excluding the COVID-19 period). He makes efforts to keep his ambient temperature around 22 degrees Celsius (72 degrees Fahrenheit) wherever he is, noting that temperature affects glucose levels. On travel days, he diligently follows his diet and exercise plan, for example, choosing to walk around inside of airports rather than sitting idly.

His daily schedule is regimented to optimize his health and productivity. He sleeps from 10-11 pm to 6-7 am, ensuring 7-8 hours of sleep, and tracks nighttime awakenings to monitor his kidney and bladder health.

Mornings are for recording biomarkers and staying informed through newspaper reading. Since August 11, 2023, he has also started recording his body fat rate, visceral fat rate, and muscle mass.

His daily meal schedule is seasonally adjusted by his AI software: breakfast at 8 am in winter and 7 am in summer, lunch at 12 noon, and dinner at 6 pm in summer and 5 pm in winter. His AI software seamlessly adapts meal times in line with the season changes, considering the convenience of his post-meal exercise routine due to sunlight. Each meal, predominantly Mediterranean diet in nature, is followed by a 45 minutes' walk, extended to an hour if the meal is higher in carbohydrates, aiming for 4,000 to 5,000 steps at about 100 steps per minute. He has noticed that sugary foods spike his postprandial glucose (PPG) levels more rapidly, whereas carbohydrates have a more prolonged effect. For his walks, he chooses safe locations like beach pathways in Hawaii and Vancouver, large parks in Northern California, underground shopping areas in Taipei and Tokyo, or large shopping malls like Walmart or Costco in Northern California and Las Vegas, to avoid risks associated with traffic or uneven terrain, which is particularly important for seniors.

During his post-meal walks, he makes productive use of this exercise time by engaging in various activities related to his medical research. This involves subject thinking, medical problem-solving, data analysis, graphic interpretation, pattern recognition, puzzling medical texts, listening to certain academic audios, updating knowledge via YouTube, information search on Google/Wikipedia, and relaxing with music listening via Air Pods. Safety is his top priority in conducting his research work this way. Consequently, his exercise time also doubles as working time, benefitting both his body health and mind activities. In addition, he extensively uses his iPhone or iPad and other AI devices for these tasks, with an average daily screen time of 8.5 hours or more, given the need to conduct his medical research. While he is aware of the potential impact on his old eyes due to age-related macular degeneration (MD), he prioritizes his research needs. To mitigate excessive using his eyes, he has acquired a lightweight, large-font iPad Pro for his reading and writing.

For individuals with Type 2 Diabetes who are employed, a significant challenge is incorporating the "post-lunch" walk into their daily routine. Unlike post-breakfast or post-dinner exercise, which they can schedule at their convenience, the lunchtime walk requires more planning. Thankfully, those with standard work hours typically have a one-hour lunch break, allowing 20 to 30 minutes for a walk. This walk is best conducted in an environment that offers protection from adverse weather conditions like rain, cold, or heat. Encouragingly, they could walk and talk with a colleague or client, much like a medical doctor might do. For those experiencing joint pain, wearing supportive footwear or using walking aids can help alleviate joint stress. The author, who has successfully managed plantar fasciitis caused by excessive walking in ill-fitting shoes, and foot ulcers resulting from severe diabetes neuropathy complications, demonstrates how one can balance medical conditions with lifestyle adjustments. Ultimately, reaching these health milestones depends largely on the patient's personal commitment and dedicated efforts.

For patients with severe Type 2 Diabetes (T2D), it is advisable to take a post-meal walk of approximately 3,000 to 4,000 steps. In contrast, those with less severe diabetes should target 1,000 to 2,000 steps. While exercise, contributing about 35% to 40% to glucose regulation, is essential, it is slightly less critical compared to diet control, which accounts for approximately 60% to 65% of glucose management. The author's own studies suggest a diet-to-exercise ratio within a range of 1.5 to 2.2, indicating the greater importance of diet over exercise. According to pathophysiological pathways, the ratio between diet (related to all 8 pathways) and exercise (related to 5 pathways only) is 1.6 (8 divided by 5). Exercise plays a key role in burning off excess energy from food. Excess energy remaining in the body can potentially damage many internal organs. The author employed wave theory in the frequency domain, along with energy theory and viscoplastic energy analysis in both spatial and frequency domains (including aspects of Einstein's theory of relativity), to measure the damage to heart and brain arteries, as well as to micro-vessels in the kidneys, eyes, bladder, etc., caused by residual glucose energy carried by red blood cells. This comprehensive approach has enabled the

author to extend his investigations into severe diseases such as dementia and various cancers. During the last 4 to 5 years, he has written and published about 100 papers in these two fields.

In December 2021, the author received a pivotal suggestion from Professor Norman Jones, his academic advisor at MIT. Professor Jones advised incorporating the Viscoplastic method into the author's medical research, recognizing its potential for managing the time change rates of outputs, like diseases or symptoms. This advice led the author to not only revisit the subject but also integrate it into his medical AI software, Chronics, on his iPhone. Employing the Space-Domain Viscoplastic Medicine Energy Theory (SD-VMT), the author dramatically cut down his data processing time from 6 hours using Excel to just 2 seconds using AI, also significantly enhancing the numerical accuracy and reliability. Utilizing this method, he has authored nearly 400 papers on various research subjects. He attributes his success and growth to Professor Jones's invaluable guidance and emotional support over the last five decades since his school days in 1972 at Cambridge, Massachusetts.

The author reflects on his 24-year journey of self-study and medical research, devoting the first 9 years to psychology and the following 15 years to internal medicine. While he maintains a neutral stance on political and religious matters, he strongly supports a fundamental human right: the right to "health, happiness, and freedom" for all individuals. He sees this as his life's mission, especially in his senior years.

His personal experience of achieving weight reduction and glucose control, thereby reducing the risk of having or developing mortality diseases through his unique approach combining mathematics, physics, and engineering research methods in medicine, stands as his most significant and fulfilling achievement. He has saved his own life without medications or surgeries.

This article also embodies the belief that "where there's a will, there's a way," demonstrating how determination and persistence can lead to remarkable personal and professional breakthroughs.

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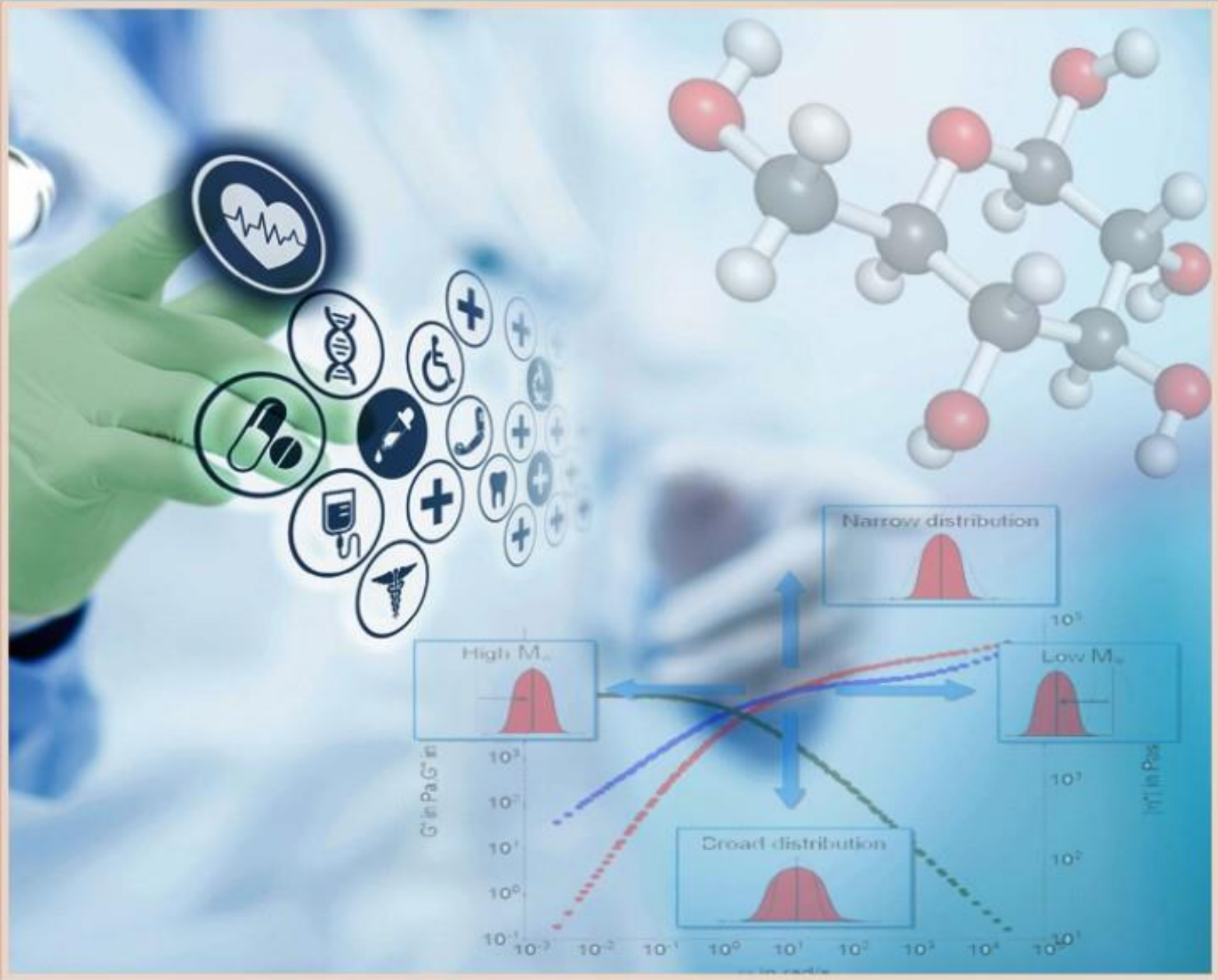
Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

Gerald C. Hsu



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