CASE STUDY

Detailed Contribution Analysis of Metabolism Index Categories on Risk Probability Percentage of Having Cardiovascular Disease or Stroke Using GH-Method: Math-Physical Medicine (No. 316)

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ABSTRACT

The author uses his developed GH-Method: Math-physical medicine approach to investigate a more detailed contribution analysis of metabolism index (MI) on the sub categories for three medical conditions and three lifestyle details based on his risk probability percentages of having cardiovascular disease (CVD) or stroke for over a period of 10+ years. Listed below is a table of his annualized risk probability percentage based on MI of having CVD or stroke:
Y2010: 100%
Y2011: 90%
Y2012: 83%
Y2013: 85%
Y2014: 72%
Y2015: 60%
Y2016: 55%
Y2017: 54%
Y2018: 54%
Y2019: 55%
Y2020: 51%.
This article describes the individual contributions from MI which includes three medical conditions subcategories (glucose, blood pressure, and lipids) and three lifestyle subcategories (food, exercise, and others) of different modeling associated with artery blockage and artery rupture scenarios based on the risk probability percentage of having CVD or stroke. His research results from the past 10+ years have demonstrated the importance of maintaining an excellent healthy state for the entire body through a stringent lifestyle program to reduce the risk of having CVD or stroke. Emphasis has been placed on the significance and contributions for a patient's overall metabolism state. Therefore, three subcategories of specific medical conditions (diabetes, hypertension, and hyperlipidemia) along with three subcategories of lifestyle (food, exercise, and others) including weight and waistline are quantified. As a result, the findings corroborated with the advice from health-care professionals to their patients.

Key words: Contribution analysis, metabolism index, risk probability percentage, cardiovascular disease, stroke, GH-Method: math-physical medicine

INTRODUCTION

The author uses his developed GH-Method: Math-physical medicine approach to investigate a more detailed contribution analysis of metabolism index (MI) on the subcategories for three medical conditions and three lifestyle details based on his risk probability percentages of having cardiovascular disease (CVD) or stroke for over a period of 10+ years.

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METHODS

To learn more about the MPM method, readers can review the article in Gerald,[1] along with the outlined history of his personalized diabetes research and application tools development in Gerald.[2]

In 2014, the author applied topology concept of mathematics and finite element method of engineering, to develop a 10 dimensional complex mathematical model of metabolism which contains four output categories (weight, glucose, blood pressure [BP], and lipids) and other lab tested data (American College of Radiology [ACR], thyroid-stimulating hormone [TSH], and others), and six input categories (food, water intake, exercise, sleep, stress, and routine life patterns), and ~500 detailed elements. He further defined two new parameters, MI, as the combined score of the above 10 metabolism categories (dimensions) and 500 detailed elements, and general health status unit (GHSU), as the 90 days moving average value of MI. Please noted that MI (where i = 1 through 10) represents individual metabolism score of each category. Since 2012, he has collected ~2 million data of his own biomedical conditions and personal lifestyle details. He only utilized a part of his big database for analysis work in this article.

Next, he developed a few suitable algorithms containing some different weighting factors which include a patient's baseline data (gender, age, race, family genetic history, medical history, bad habits, body mass index [BMI], weight, and waistline), medical conditions (diabetes, hypertension, and hyperlipidemia), and lifestyle details (food, exercise, and others). After continuously collecting sufficient input data for a decade, he can then conduct the following three sets of calculations:

(A) Medical conditions – individual M2 through M4 for diabetes, hypertension, hyperlipidemia, and others. These three metabolic disorder values include a patient's self-collected biomedical data and the lab tested medical examination results. Through his previous research for the past 5 years, he already detected that glucose is the "principal criminal" and BP with lipids is the "accessory criminals" in terms of induced complications from chronic diseases, specifically CVD, stroke, renal problems, diabetic retinopathy, and even cancers. More precisely, his mathematical model for CVD or stroke includes two scenarios. The first scenario is the artery blockage situation which involves diabetes (glucose), hypertension (BP), and hyperlipidemia (lipids) where he applied his acquired fluid dynamics concept. The second scenario is the artery rupture situation which involves diabetes (glucose) and hypertension (BP) where he applied his acquired solid and fracture mechanics concept.

(B) Lifestyle details – individual M5 through M10 which affect medical conditions directly or indirectly. In this category, he includes the following three subcategories with a total of nine detailed elements. (B-1) Three foods: Quantity, quality, and carbs/sugar amount; (B-2) Two exercises: Daily walking steps and post-meal waking steps; (B-3) Four others: Water intake, sleep, stress, and daily life routines.

(C) MI and GHSU scores – MI is a combined score of M1 through M10 using engineering finite element method. GHSU is the 90 days moving average MI curve which can show the MI's trend clearly. The break-even point for MI is 73.5%, where the levels of risk percentage for the separated groups of medical conditions and lifestyle details are 62%. In other words, being above the break-even line is worse but staying below the break-even line is better.

With this developed mathematical risk assessment tool, he can obtain three separate risk probability percentages associated with each of these three calculation models mentioned above. As a result, this tool would offer a range of the risk probability predictions of having CVD or stroke, depending on the patients' medical conditions, lifestyle details, or the combined metabolism impact on the human body.

Due to the limited space for this paper, he only presents his results based on medical conditions.

The author is a 73-year-old male who has a history of three severe chronic diseases for 25 years. In addition, he also experienced five cardiac episodes from 1994 through 2008 and was diagnosed with an acute renal problem in early 2010. He also suffered from foot ulcer, bladder infection, diabetic retinopathy, and hypothyroidism. He weighed 220 lbs in 2000 and his HbA1C level was 10.0% in 2010.

In 2014, he developed the mathematical metabolism model and started his stringent and comprehensive lifestyle management program. As a result, his overall health conditions have been noticeably improving since 2013–2015 when he started to reduce the dosage of his three prescribed diabetes medications. By the end of 2015, he completely stopped taking them. During the entire period of 2016–2019, his HbA1C average value was 6.6% without medication. During the recent Coronavirus Disease (COVID)-19 quarantine period from January 19, 2020, to August 22, 2020, his HbA1C has further decreased to 6.1%.

RESULTS

The author has written a few medical papers regarding the subject of risk probability of having a CVD or stroke based on his annual data when available (Gerald).[3] The difference between this article and his previous ones is 2-fold. First, in this article, he focuses on individual contributions from three subcategories of biomarkers, including glucose, BP, and lipids, and three major lifestyle subcategories, comprising food, exercise, and others, instead of taking the overall performance score based on medical conditions or lifestyle details to conduct his risk assessment calculations. Second, he changed a few "weighting factors" in his algorithm to reflect some of his newly acquired knowledge of different diseases. However, this weighting factor change only reflects some nominal or insignificant changes on his ending result of risk probability percentages of having CVD or stroke. The overall trend and significant levels remain the same as in his previous papers.

Figure 1 illustrates the background data table of his three analysis, including medical conditions, lifestyle details, and MI results.

In Figure 2, the top diagram illustrates three contribution percentage line charts of glucose, BP, and lipids, whereas the bottom diagram reflects three contributions percentage line charts of food, exercise, and other lifestyle details.

In Figure 3, the top line chart diagram shows the contribution percentage of genetic and personal medical conditions, lifestyle details, and 80% of MI. The bottom bar chart diagram depicts the CVD/stroke risk probability percentage comparison among medical conditions, lifestyle details, and MI.

It should be noted that weight and waistline (being overweight or obese) have been included in the baseline category for personal long-term factors because weight conditions similar to personal bad habits, such as smoking cigarettes, drinking alcohol, and abusing substances, are difficult to change within a short period of time.

The established targets of his MI components are as follows:

Medical conditions

Glucose: <120 mg/dL
Systolic blood pressure (SBP): <120 mmHg

Year	Genetic & Personal	Lifestyle Total	Medical Total	80% of MI
Y2010	10%	86%	87%	90%
Y2011	10%	78%	75%	80%
Y2012	10%	70%	63%	73%
Y2013	10%	66%	51%	75%
Y2014	10%	58%	53%	62%
Y2015	9%	53%	51%	51%
Y2016	8%	49%	47%	47%
Y2017	9%	46%	44%	46%
Y2018	9%	46%	47%	46%
Y2019	9%	46%	49%	47%
Y2020	9%	43%	47%	43%

Figure 1: Background data table of cardiovascular disease/stroke risk probability % based on metabolism index (MI) (genetic and personal, medical conditions, lifestyle details, and 80% of MI)

Diastolic blood pressure (DBP_: <80 mmHg
Heart rate: >60 and <100 bpm

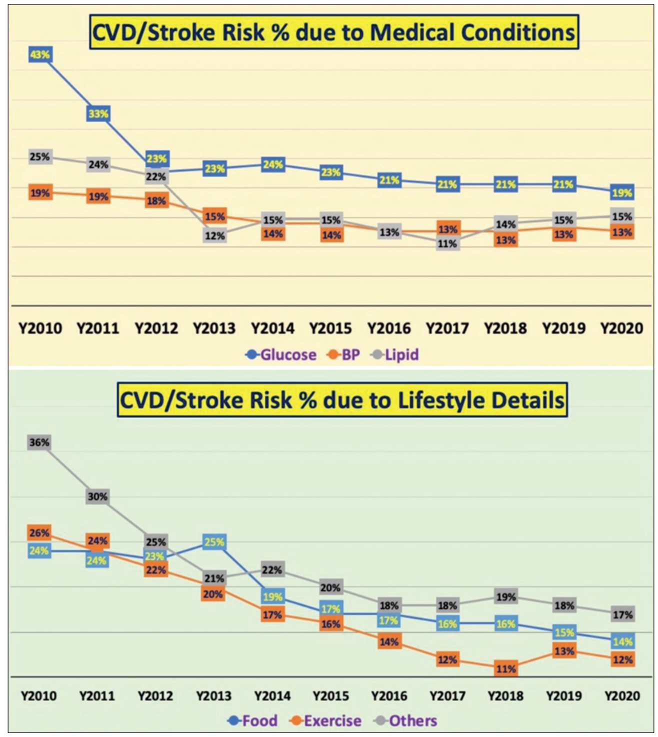

Figure 2: Contribution % of medical conditions and lifestyle on cardiovascular disease/stroke risk probability %

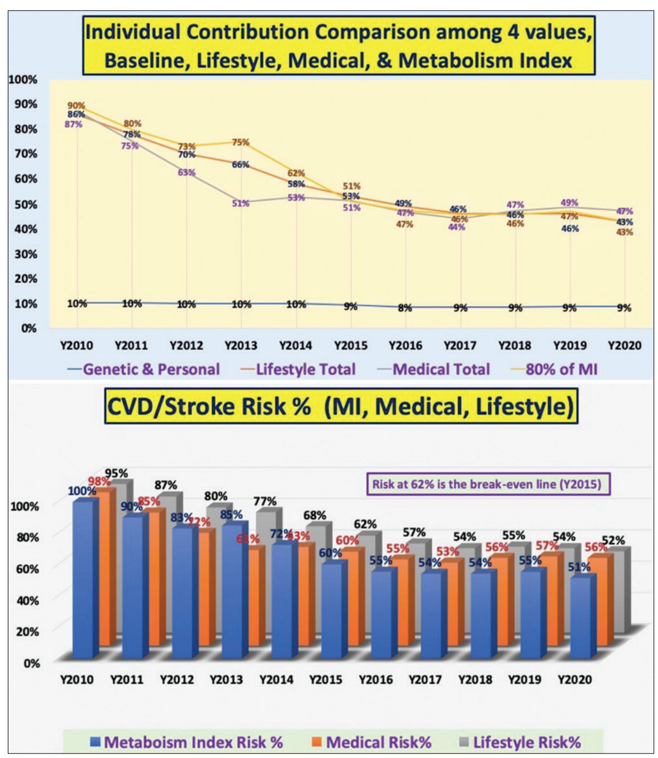

Figure 3: Comparison of various contribution % and cardiovascular disease/stroke risk probability % based on metabolism index, medical conditions, and lifestyles

Triglycerides: <150 mg/dL
High-density lipoprotein (HDL) cholesterol: >40 mg/dL
Low-density lipoprotein (LDL) cholesterol: <130 mg/dL
Total cholesterol: <200 mg/dL.

Lifestyle details

Food quantity: 73.5%
Food quality: 73.5%
Carbs/sugar: 20 g
Daily walk: 15,000 steps
Post-meal walk: 4000 steps
Water intake: 2500 cc
Sleep quality: 73.5%
Stress: 73.5%
Daily life routine: 73.5%.

If the patients meet all of the above targets, they will get a "break-even" score of ~53%. Since no person would get a "perfect" score on his or her genetic factors and personal long-term factors, the author could provide an average score of ~10% for the worst-case scenario of 20%. As a result, the combined "break-even" risk probability percentage of having CVD or stroke resulting from medical conditions is 62%. However, the break-even MI level is 64%. If the risk percentage is higher than 62–64%, this indicates a higher risk. However, if the risk percentage is lower than 62–64%, this implies a lower risk.

In Figure 2, the top diagram displays all of his three curves of contribution percentages from medical conditions (glucose, BP, and lipids) which are decreasing year after year due to his continuous improvements on the control of metabolic disorders through his stringent lifestyle management program, where he completely stopped taking medication since the late 2015. The three medical contribution percentage curves stabilized after 2013. His annual average glucose showed the most noticeable reduction from 43% of contribution (280 mg/dL) in 2010 down to 23% of contribution (133 mg/dL). From 2010 to 2013, he took high dosages of three different diabetes medications which were similar to the period prior to 2010; however, the major differential factors to reduce hyperglycemia were due to his awareness on the importance of his daily lifestyle by implementing a stringent lifestyle management program based on scientific evidence (Gerald).[4]

In Figure 2, the bottom diagram presents all of his three percentages of lifestyle details (food, exercise, and others) which are being reduced year after year due to his stringent lifestyle management program. From judging his three curves over the period of 2017–2020 and his knowledge of this mathematical model, he has possibly reached a "near-optimal" state (i.e., high cost/return ratio) in terms of further potential improvements on managing his food, exercise, and others. Another observation is that it can take many years to change our health state, including both medical condition reversal and lifestyle improvements.

The following information from 2020 demonstrates the above observations and highlights of his improvement on chronic diseases over the recent COVID-19 quarantine period (January 19, 2020–August 22, 2020):

Medical conditions

Weight: 172 lbs.
BMI: 25.0
Waistline: 33 inch
SBP: 108 mmHg
DBP: 60 mmHg
Heart rate: 59 bpm
Triglycerides: 110*
LDL cholesterol: 123*
HDL cholesterol: 49*
Total cholesterol: 168*
ACR: 19*
TSH: 2.66*
PSA: 110*.

Lifestyle details

Food quantity: 67.7% of normal
Food quality: 50.1% (50% best)
Carbs/sugar: 12.2 g/meal
Daily walk: 15,904 steps
Post-meal walk: 4280 steps/meal
Water intake: 2984 cc/day
Sleep quality: 59.7%
Stress: 50.0% (50% best)
Daily life routine: 70.0%.

Due to COVID-19, the author was unable to get the necessary blood work done for his lipids, ACR, TSH, PSA, and others at the laboratory; therefore, the asterisk (*) next to the numbers is the average measured values in 2019.

Since 2012, the author kept detailed and completed data from the past 8.5 years. In 2010 and 2011, he could only use some spotted records for guesstimated results, but the data still represent his previous years accurately.

In Figure 3, the top diagram shows the final calculated total contribution percentage of medical condition, lifestyle, and MI which are declining year after year. However, the baseline curve (genetic factors and personal long-term factors) remains at a constant level, approximately 9%–10%. Baseline conditions usually do not change, except for age (getting older each year) and weight (possible fluctuations). In the bottom diagram, the CVD/stroke risk probability percentage bars are also diminishing year after year. Even though 2010 and 2011, involved guesstimated data, they were alarmingly high with 98% based on risk percentage for medical conditions and 95% for lifestyle. This explains why he suffered many diabetes-related complications during this time. The "turning point" was 2015 when all of his three CVD risk percentages decreased to

62%–63% level. Finally, during 2020, his lifestyle changed dramatically due to the quarantine impact on his diet, exercise, sleep, stress, daily routines, and so forth. In other words, he worked even harder to maintain his lifestyle management in 2020. Finally, his CVD risk percentage reduced to 56% for medical condition, 52% for lifestyle, and 51% for MI.

Listed below is a table of his annualized risks probability percentage based on MI of having CVD or stroke [Figure 3]:

Y2010: 100% (weight 198 lbs, BMI 29.2, waistline 44 inches, glucose 280 mg/dL)
Y2011: 90% (glucose 200 mg/dL)
Y2012: 83% (glucose 128 mg/dL)
Y2013: 85% (glucose 133 mg/dL)
Y2014: 72% (developed metabolism model, glucose 135 mg/dL)
Y2015: 60% (FPG control, glucose 129 mg/dL, stopped medication)
Y2016: 55% (PPG control, glucose 119 mg/dL)
Y2017: 54% (BMI 25, glucose 117 mg/dL)
Y2018: 54% (heavy traveling, glucose 116 mg/dL)
Y2019: 55% (heavy traveling, glucose 114 mg/dL)
Y2020: 51% (weight 172 lbs, BMI 25, waistline 33 in, glucose 109 mg/dL).

Due to his heavy travel schedules of attending more than 60 medical conferences from 2018 to 2019, his MI risk probability percentage increased from 54% in 2018 to 55% in 2019; however, during the recent stabilized quarantined life in 2020, it actually assisted him in lowering his risk to a record low of 51%.

It should be noted that the risk probability percentages are expressed on a "relative" scale and not on an "absolute" scale. However, by keeping the "break-even" line of 63% (actually between 62% and 64%) in mind, one can quickly judge the different severe levels from the calculated CVD/stroke risk probability percentages.

CONCLUSION

This article describes the individual contributions from MI which includes three medical conditions subcategories (glucose, BP, and lipids) and three lifestyle subcategories (food, exercise, and others) of different modeling associated with artery blockage and artery rupture scenarios based on the risk probability percentage of having CVD or stroke. His research results from the past 10+ years have demonstrated the importance of maintaining an excellent healthy state for the entire body through a stringent lifestyle program to reduce the risk of having CVD or stroke.

Emphasis has been placed on the significance and contributions for a patient's overall metabolism state. Therefore, three subcategories of specific medical conditions (diabetes, hypertension, and hyperlipidemia) along with three subcategories of lifestyle (food, exercise, and others) including weight and waistline are quantified. As a result, the findings corroborated with the advice from health-care professionals to their patients.

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