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Antibiotics 2019: Methodology of math-physical medicine (GH-Method) - Gerald C. Hsu - eclaireMD Foundation

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Introduction:

This paper describes the math-physical medicine approach (MPM) of medical research utilizing mathematics, physics, engineering models, and computer science, instead of the current biochemical medicine approach (BCM) that mainly utilizes biology and chemistry.

Math-physical medicine starts with the observation of the human body's physical phenomena (not biological or chemical characteristics), collecting elements of the disease related data (preferring big data), utilizing applicable engineering modeling techniques, developing appropriate mathematical equations (not just statistical analysis), and finally predicting the direction of the development and control mechanism of the disease.

Methodology of MPM on Diabetes Research:

Initially, the author spent four years of self-studying six chronic diseases and food nutrition to gain in-depth medical domain knowledge. During 2014, he defined metabolism as a nonlinear, dynamic, and organic mathematical system having 10 categories with ~500 elements. He then applied topology concept with partial differential equation and nonlinear algebra to construct a metabolism equation. He further defined and calculated two variables, metabolism index and general health status unit. During the past 8.5 years, he has collected and processed 1.5 million data.

Since 2015, he developed prediction models, i.e. equations, for both postprandial plasma glucose (PPG) and fasting plasma glucose (FPG). He identified 19 influential factors for PPG and five both wave energy theories, he extended his research into the risk probability of heart attack or stroke. In this risk assessment, he applied structural mechanics concepts, including elasticity, dynamic plastic, and fracture mechanics, to simulate artery rupture and applied fluid dynamics concepts to simulate artery blockage. He further decomposed 1,200 glucose waveforms with 21,000 data and then re-integrated them into 3 distinctive PPG waveform types which revealed different personality traits and psychological behaviors of type 2 diabetes patients between two variables, he used spatial analysis. Furthermore, he also applied Fourier Transform to conduct frequency domain analyses to discover some hidden characteristics of glucose waves. He then developed an AI Glucometer tool for patients to predict their weight, FPG, PPG, and A1C. It uses various computer science tools, including big data analytics, machine learning (self-learning, correction, and simplification), and artificial intelligence to achieve very high accuracy (95% to 99%) mg/dL and A1C is 6.5%. Since his health condition is stable, he no longer suffers from repetitive cardiovascular episodes.

Image

Comparison of Methodology	Bio-Chemical Medicine (BCM)	Math-Physical Medicine (MPM)
Academic Foundation	Based on both Biology and Chemistry, which are both based on Physics and Math	Based on Engineering and Physics, which are both based on Mathematics
Precision and Accuracy of Results	It appears that most likely the results are less precise and less accurate than MPM	Most likely more precise and accurate than BCM due to mathematics and physics
Data Size	It seems that most of the data size is smaller (hundreds to thousands)	Most of the data size are larger (thousands to millions)
Application of Mathematics	It appears that mostly utilizing statistics (an extension of mathematics)	Mostly utilizing mathematical equations, including many branches of mathematics
Distinguish by Importance Level (Weighting Factors)	It appears that mostly no weighting factors are considered before analysis	Figuring out various weighting factors and then assigned to key influential factors (Engineering Concept for approximation)
Data Collection and Cleaning	It seems that most of work spends 50% to 80% on data collection, cleaning, and organization	Spend only 10% to 30% on data collection, cleaning, and organization by utilizing computer technology, including AI

Table: Comparison of MPM vs. BCM

This paper presents a system to more accurate prediction of glucose if possible, and measure of A1C glycohemoglobin, to achieve better control of the disease processes of T2D, and to predict untoward cardiovascular events. The author describes his math-physical medicine approach (MPM) to reach more accurate glucose predictions and A1C readings, utilizing mathematics, physics, engineering modeling, and computer science tools, instead of the current biochemical medicine approach (BCM) that mainly utilizes biology and chemistry. The attached Table 1 illustrates some fundamental differences between the traditional bio-chemical medicine (BCM) methodology and the non-traditional math-physical medicine (MPM) methodology.

Conclusion:

More importantly, in the author's opinion, his non-traditional research methodology of MPM can provide a quantitative proof with very high accuracy on other disease research work as well. After all, medicine is based on biology and chemistry while biology, chemistry, and engineering are based on physics. Mathematics is the mother of all sciences; even physics is based on mathematics. When we dig into our application problems down to foundation level, we are bound to be able to find out more facts and truth. This is what "math-physical medicine" is about.

This work is partly presented at 6th World Congress and Exhibition on Antibiotics and Antibiotic Resistance June 03-04, 2019 held at London, UK

Recent Publications:

1. Hsu, Gerald C. Using Math-Physical Medicine to Control T2D via Metabolism Monitoring and Glucose Predictions. Journal of Endocrinology and Diabetes. 2018;1(1):1–6.

2. Hsu, Gerald C. Using Math-Physical Medicine to Analyze Metabolism and Improve Health Conditions. Video presented at the meeting of the 3rd International Conference on Endocrinology and Metabolic Syndrome 2018, Amsterdam, Netherlands.

3. Hsu, Gerald C. Using Signal Processing Techniques to Predict PPG for T2D. International Journal of Diabetes & Metabolic Disorders. 2018; 3(2):1–3.

4.Hsu, Gerald C. Using Math-Physical Medicine and Artificial Intelligence Technology to Manage Lifestyle and Control Metabolic Conditions of T2D. International Journal of Diabetes &Its Complications.2018; 2(3):1–7.