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Using math-physical medicine to study the probability of having a heart attack or stroke based on metabolic conditions

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Background & Aim: The author had extended his 8-year T2D research to focus on the relationship between metabolic diseases and the probability of having a heart attack or stroke.

Material & Method: He developed big data numerical simulation models using ~1.5M data. Initially, he had chosen age, gender, race, family history, smoking, drinking, drug abuse, medical health conditions and weight/waistline to establish a static baseline. He then applied hemodynamics knowledge to develop a macro-simulated mathematical model for the dynamic situations of blood blockage and artery rupture. He utilized 72,893 data of chronic disease conditions (output data of obesity, diabetes, hypertension and hyperlipidemia) within the past 2,274 days to compute the probability of having a heart attack or stroke in the near future. Finally, sensitivity analyses was conducted to cover the probability variance by using different Weighting Factors (WF).

Results: Comparing the results from the worst year, 2000, to the health-improving period of 2012-2018, the probability values are: 2000 with BMI 31: 74%, 2001-2006: Three episodes of chest pain, 2012 with BMI 29: 62%, 2017: 26.4%, 2018 with BMI 25: 31% (Framingham 2017: 26.7%). In summary, within eight years, he has an average of 34% probability with ±10% variance of WF sensitivity.

Conclusion: The mathematical simulation results are validated by past health examination reports. This big data dynamic simulation approach using math-physical medicine will provide an early warning to patients with chronic disease of having a heart attack or stroke in the future.

Biography

Gerald C Hsu has received an honorable PhD in mathematics and majored in engineering at MIT. He has attended different universities over 17 years and studied seven academic disciplines. He has spent 20,000 hours in T2D research. First, he studied six metabolic diseases and food nutrition during 2010-2013, then conducted research during 2014-2018. His approach is "math-physics and quantitative medicine" based on mathematics, physics, engineering modeling, signal processing, computer science, big data analytics, statistics, machine learning, and AI. His main focus is on preventive medicine using prediction tools. He believes that the better the prediction, the more control you have.

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