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Using big data and prediction technologies to control chronic metabolic conditions via lifestyle management (part of math-physical medicine)

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Background and Aim: The author has spent seven years to monitor and analyze conditions and lifestyle details of a patient who has chronic diseases. He has collected and processed ~1.5M data. This paper provides results and conclusions of the relationship between metabolic conditions and lifestyle management via big data analytics.

Material and Method: In 2014, he researched and developed a metabolism model to measure the multiple interactions of four metabolic disease outputs and six lifestyle inputs. During 2015-2016, he further developed four prediction tools, including weight, fasting plasma glucose (FPG), postprandial plasma glucose (PPG), and hemoglobin A1C based on various technologies, including signal processing, time series, spatial analysis, frequency domain analysis, machine learning, and Artificial Intelligence. He has utilized specifically 388,513 data which include 72,893 metabolic conditions (obesity, diabetes, hypertension, hyperlipidemia) and 295,620 lifestyle conditions (food, exercise, water, sleep, stress, daily life routine) within 2,300 days (1/1/2012-4/20/2018). Finally, he separately calculated the combined scores of four metabolic conditions and six lifestyle categories.

Results: The lower the value indicates better or healthier condition. The results are listed below:

1) Metabolic conditions: From 111% in 2012 with a decrease to 75% in 2017, with an average of 89% ;

2) Lifestyle conditions: From 75% in 2012 with a decrease to 41% in 2017, with an average of 46%.

During 2012-2013, the results were not as clear due to insufficient data; therefore, an extrapolation method and data from memory were used in computation. Furthermore, only 110 days' data were available for 2018. However, the author believes that the annual result of 2018 would be better than 3.7 months.

The patient's chronic diseases are completely under controlled via a quantitative lifestyle management. His BMI dropped from >30 to <25. His average glucose and A1C decreased from 280 mg/dL to 119 mg/dL and 10.0% to 6.4%, respectively. He no longer has hypertension and hyperlipidemia. About eight years ago, he had difficulty climbing stairs, but recently he completed a 10K marathon. He had suffered three episodes of chest pain in 2000. His cardiovascular risk (Framingham) was 62% in 2012 and now is 26%.

Conclusion: The author has monitored, collected, and processed big data including 10 categories, ~500 elements, ~1.5 million data of medical, health, and lifestyle situations for this 7-year project. The patient's "nearly-collapsed" condition has been turned into a "perfectly-controlled" situation. Along the way, four useful prediction tools were developed via math-physical medicine for other patients to use. All of these tools have reached to 97%-99% accuracy. This clinical case has demonstrated the importance of preventive medicine and lifestyle management for controlling chronic diseases.

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