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SYMPOSIUM

Use of Fourier Models for Analysis and Interpretation of Continuous Glucose Monitoring Glucose Profiles

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Abstract

Background:

The introduction of continuous glucose monitoring (CGM) devices has dramatically increased the amount of information available about each patient. While CGM has become a useful diagnostic tool for the individual patient, interpretive issues including noise reduction remain and further analytical work is needed to fully utilize the data richness.

Method:

We applied discrete Fourier transform methodology to CGM data to obtain an overall statistical model providing the dimension reduction necessary for insightful analyses of the whole function and explored some properties and possible applications of this technology.

Results:

The following example applications are shown. Discrete Fourier transform allows reduction of noise using an objective statistical criterion and may, as a first step, possibly enhance the value of various measures of variability through this noise reduction. Average functions of groups in a prospective randomized clinical are demonstrated and the aggregate function is readily visualized. Second and third harmonic amplitudes at baseline correlate with hemoglobin A1c after a 6-month treatment period. The time points of most rapid glucose decreases are identified easily with the functional through the second derivative, and its correlation with subsequent reported symptomatic hypoglycemia is shown.

Conclusions:

Discrete Fourier transform offers an attractive analytical methodology for CGM data given the achievable dimension reduction without loss of essential information as well as its ability to eliminate noise.

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Abbreviations: (BG) blood glucose, (CGM) continuous glucose monitoring, (HbA1c) hemoglobin A1c, (NPH) neutral protamine Hagedorn

Keywords: continuous glucose monitoring, CGM, diabetes, discrete Fourier transformation, fluctuation, Fourier, function, glucose, glycemic variability, group function, hypoglycemia, insulin, variability

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