Interpolation of FGM data for the improved identification of hypoglycaemic episodes

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Flash glucose monitoring (FGM) is increasingly used by people with type 1 diabetes (T1D). FGM records blood glucose (BG) measurements every fifteen minutes. When calculating number of hypoglycaemic episodes, this time interval means that events of fifteen to thirty minutes may be missed. This research aims to determine if interpolation could be used to accurately estimate BG between readings to improve the identification of these short hypoglycaemic episodes.

Research Design and Methods: Thirty six people with T1D training for the Swansea half marathon wore an FGM for 8 weeks. Missing intervals within data were identified and excluded and multiple interpolation algorithms were applied to the remaining data to estimate BG during gaps. Predictions were verified using over 55,000 manual flash measurements.

Results: The agreement of interpolated BGs with manual scanned readings were very high for all methods. The most effective was PCHIP, with an R^2 of 0.9822 and an RMSE of 0.254mmol/L. PCHIP identified a median of 13.7% more hypoglycaemic episodes compared to no interpolation.

Discussion: Interpolation is shown to be an effective method for filling gaps between FGM readings, enabling the enhanced identification of short hypoglycaemic episodes. *