Reviewer's report

Title: Q-Score: Development of a new metric for continuous glucose monitoring that enables stratification of antihyperglycaemic therapies

Version: 3 Date: 22 September 2014

Reviewer: David Pober

Reviewer's report:

General Comments:
The authors have an interesting and useful concept and factor analysis is suitable for addressing their goal. Several issues must be addressed, however, before a thorough evaluation of their work can be made.

Major Compulsory Revisions:

1) While the authors present an inventive application of factor analysis to a meaningful clinical issue, they do not adequately acknowledge the existence and/or limitations of the work of other authors who have utilized other pattern-recognition approaches to classifying CGM data with the intent of providing personalized care tools (e.g. Eberle C, Ament C. Real-time state estimation and long-term model adaptation: a two-sided approach toward personalized diagnosis of glucose and insulin levels. J Diabetes Sci Technol. 2012 Sep 1;6(5):1148-58.; Jensen MH, Christensen TF, Tarnow L, Seto E, Dencker Johansen M, Hejlesen OK. Real-time hypoglycemia detection from continuous glucose monitoring data of subjects with type 1 diabetes. Diabetes Technol Ther. 2013 Jul;15(7):538-43. doi: 10.1089/dia.2013.0069. Epub 2013 Apr 30.)

2) Central to the difficulty in evaluating the validity of the present approach is the lack of information about the dataset used for validation and the lack of traditional metrics for the accuracy of classification tools. It is not clear whether the evaluation of the performance of the Q-score was conducted using CGM data from the same set of records that were used to develop the score or whether those evaluation records were from an independent sample. As such, it is not possible for the reader to make a judgment about the appropriateness and extent of validation of the Q-score.

3) Once it has been clarified whether the Q-score was validated on new records, or on a subset of the records used in score development, the method of validation of the score should be formalized. Some ‘flavor’ of sensitivity and specificity (correct and false categorizations) should be used. We refer the authors to the two citations above and to Wang Y, Wu X, Mo X., A novel adaptive-weighted-average framework for blood glucose prediction. Diabetes Technol Ther. 2013 Oct;15(10):792-801. doi: 10.1089/dia.2013.0104. Epub 2013 Jul 24., for examples of evaluation metrics for classification.
4) As presented, the Q-score would be limited in its clinical utility as the reader lacks information about whether this scoring method could be applied to any CGM and what the magnitude or nature of possible errors related to the application of the score to categorize glucose control for a single new individual by a physician in practice.

5) Why were the individual components of the Q-score standardised? The factors that they represent accounted for different portions of the total variance in CGM profile...were weighted or other modifications of the Q-score parameter considered and compared to the Q-score with standardised components?

Minor Essential Revisions:

1) The phrase “with principal component analysis” appears in the abstract, and “PCA, principal component analysis” appears in the list of abbreviations but nowhere in the manuscript. Principal component analysis is subtly different than factor analysis, and certainly not a part of factor analysis, so these references to it should probably be removed.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests.