Validation and implementation of low-cost dynamic insulin sensitivity tests

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Objective:
Insulin sensitivity ($SI$) tests can provide important information for type 2 diabetes risk assessment and investigations of metabolism or pre-diabetes. Our group previously presented the dynamic insulin sensitivity and secretion test (DISST) and the real-time quick DISST (DISTq) as low-cost, low-burden and accurate alternatives to established tests. The DISST provides concurrent $SI$ and endogenous insulin secretion ($UN$) metrics, the DISTq does not require insulin or C-peptide assays for $SI$ identification, but can return an immediate result.

This study validates the DISST and DISTq in comparison to the euglycemic, hyperinsulinemic clamp (EIC) protocol.

Method:
Fifty participants (with 10 BMI>30; 10 BMI>25, <30; and 5 BMI<25 of each gender) underwent the EIC and DISST. The DISST protocol requires 5 samples from a 30 minute protocol similar to the IM-IVGTT. Data from the DISST protocol was sufficient to identify $SI$ using both the DISST and DISTq parameter identification methods and $UN$ from the DISST.

Result:
DISST and DISTq $SI$ values correlated well to the EIC (R=0.81 and R=0.76, respectively) and each other (R=0.84). $UN$ values obtained during the DISST showed clinically relevant distinctions between participants, and clearly differentiated the beta-cell function of impaired glucose tolerant participants who had the same EIC $SI$. Participant acceptance of the protocol was high with very minor reported adverse effects.

Conclusion:
The DISST and DISTq correlated well against the EIC compared to most established insulin sensitivity tests. The DISST can better differentiate patients as it provides $UN$ metrics that the EIC does not. A computer program makes uptake and use of the model-based DISST and DISTq tests straightforward for clinicians and researchers.