A NOVEL CALCULATOR TO DETERMINE THE RISK OF INSULIN THERAPY IN WOMEN WITH GDM

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Background: We previously published a 7-point risk factor predictor model for insulin therapy in women with gestational diabetes (GDM)[1].

Aim: To create a risk calculator for insulin therapy weighted according to the coefficients of variables, derived from the 7-point predictor model.

Methods: We analysed de-identified prospectively collected singleton pregnancy data (1992-2014) from women diagnosed with GDM at Bankstown-Lidcombe Hospital according to ADIPS(1998) criteria[2]. A logistic regression model was run with the seven dichotomised significant independent predictors of insulin therapy: maternal age >30 years, family history of diabetes, pre-pregnancy obesity (BMI ≥30 kg/m2), prior GDM, early diagnosis of GDM (<24 weeks gestation), fasting venous blood glucose level (≥5.3 mmol/l) and HbA1c at GDM diagnosis ≥5.5% (≥37 mmol/mol) on oGTT. A weighted risk score (WRS) using coefficients derived from the model was defined as:

$$\text{WRS} = \text{constant} + \text{coefficient}_1 \times \text{variable}_1 + ... + \text{coefficient}_7 \times \text{variables}_7.$$

$$\text{The } \underline{\text{Probability of insulin requirement}} \text{ was } = e^{WRS}/(1+e^{WRS}).$$

Results: There were a total 3075 GDM pregnancies. The logistic regression model demonstrated that diagnosis <24 weeks gestation and fasting plasma glucose ≥5.3 mmol/L were the strongest predictors of insulin requirement. The weakest predictor of insulin requirement was age>30. An electronic risk calculator (Microsot Excel 2007) was developed to calculate the probability of insulin therapy using the coefficients and formula described above (example screen capture below).

Calculator For The Risk of Insulin Therapy in Women with GDM

Variable	Coefficient	Coefficient x Variable	Input (Y/N)
Age>30	0.183	0.183	Y
BMI≥30	0.687	0.687	Y
Prior GDM	0.366	0	N
Family History	0.371	0.371	Y
Fasting≥5.3	0.828	0.828	Y
HbA1c≥5.5	0.632	0.632	Y
Diagnosis before 24 weeks	0.972	0	N
Sum of Coefficient x Variable		2.701	

Calculation	Value
Sum of Beta x Variable	2.069
Constant	-2.195
Calculated Weighted Risk Score (WRS)	0.506

Enter Y/N for patient

Probability Insulin Rx (%) $e^{WRS}/(1+e^{WRS})$	62%

Receiver operated characteristic (ROC) curves were plotted for both the unweighted 7-point scoring system versus the weighted risk/probability scores. The AUC were 0.715 (95% CI 0.693-0.736, p <0.0001) vs 0.730 (95% CI 0.710 - 0.751, p<0.0001) respectively.

Conclusion

A weighted risk/probability score calculator performed better than an unweighted 7 point system in predicting the likelihood of insulin therapy in women with GDM. This is a practical tool which can be used to identify GDM patients for closer monitoring or early insulin treatment.

References:

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(2) Hoffman L, Nolan, C, Wilson, JD, Oats JJN, Simmons D (1998) Gestational diabetes mellitus management guidelines. The Australasian Diabetes In Pregnancy Society. MJA pp169:93-97.

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