How can we predict diabetes resolution after metabolic surgery?

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Introduction

Nowadays, the focus in bariatric treatment is gradually shifting from the primary goal of body weight reduction toward the alleviation of obesity-related metabolic diseases[1]. Data shows the majority of patients undergoing bariatric surgery have at least one comorbidity and type 2 diabetes mellitus (T2D) is one of the most common[1,2].

Fig. 1. Comorbidities among patients undergoing bariatric surgery[1,2].

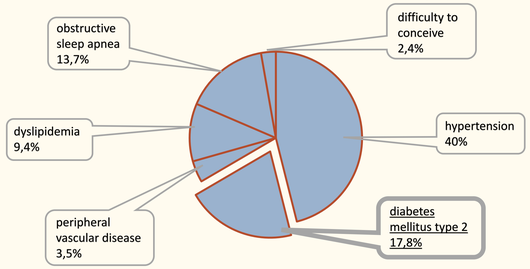
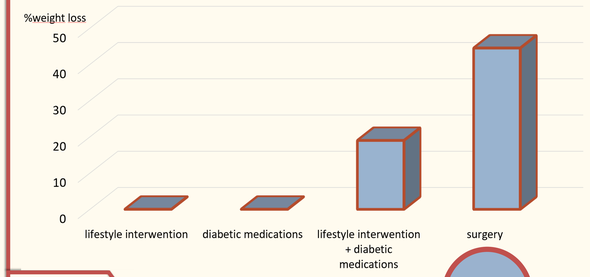


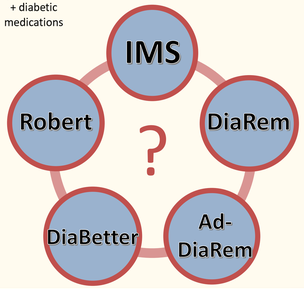
Fig. 2. Effectiveness of different type 2 diabetes treatment methods[3,4,5].



Surgical methods were proven to be the most effective type of obesity treatment in comparison to conventional medical treatment or lifestyle interventions[3,4,5]. Despite detailed preoperative assessment not all patients achieve T2D remission whereas long-term metabolic outcomes still remains unclear[6,7].

Aim

Effort has been made to explore multiple predictors of diabetes remission before surgery and as a result new risk prediction tools: Individualised Metabolic Score (IMS), DiaRem, Ad-DiaRem, DiaBetter and Robert's scores were developed and validated[8,9,10,11,12]. Still there is no scientific consensus which model should be used in clinical practice.



In the light of these fact we designed a study to validate new risk stratification models as the predictors of diabetes remission after bariatric surgery and compare them.

Materials and Methods

Our study included retrospective analysis of consecutive patients who underwent bariatric surgery between April 2009 and October 2017 in 2nd Department of General Surgery Jagiellonian University Medical College - a single tertiary referral center.

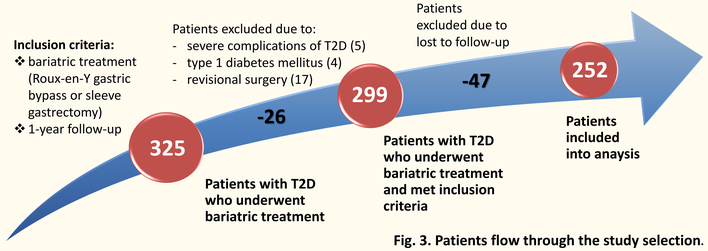
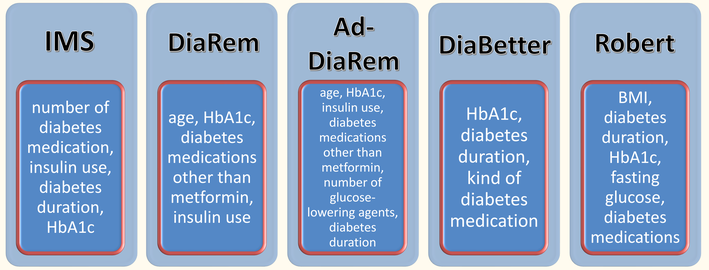
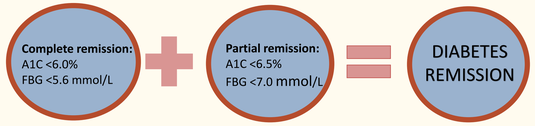


Fig. 3. Patients flow through the study selection.

For each patient scores were calculated according to the following criteria:



In our study the primary endpoint was diabetes remission defined with regard to the American Diabetes Association (ASA) definition of complete or partial remission.



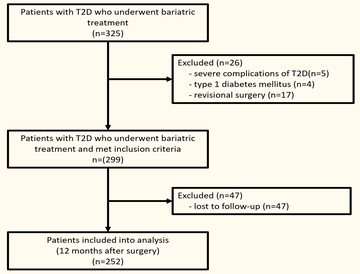
We used logistic regression model to analyse association of each score with postoperative diabetes remission. To quantify the diagnostic accuracy and calibration of these predictive models and compare them we used the area under the receiver-operating characteristic curve (AUROC) and Hosmer-Lemeshow test respectively.

Results

Tab. 1. Characteristic of patients.

Parameter	Value
number of patients	252
age, years, median (IQR)	48.00 (17.00)
women, n (%)	150 (59.52)
men, n (%)	102 (40.48)
BMI, kg/m2	45.39 (9.31)
RYGB, n (%)	134 (53.17)
SG, n (%)	118 (46.83)
diabetic medication, n (%)	216 (85.71)
insulin therapy, n (%)	81 (32.14)
diabetes duration, years, median (IQR)	6.00 (9.00)
glycated hemoglobin, %, median (IQR)	6.75 (2.00)
%EWL, %, mean±SD	53.35±21.28
diabetes remission, n (%)	228 (90.48)

Fig. 4. Flow chart of study selection.



Tab. 2. Logistic regression analysis.

Model	OR (95% CI)	p-value
IMS	0.97 (0.95-0.98)	<0.0001
DiaRem	0.83 (0.77-0.90)	<0.0001
Ad-DiaRem	0.80 (0.72-0.90)	0.0001
DiaBetter	0.51 (0.39-0.67)	<0.0001
Robert	1.93 (1.25-2.98)	0.0031

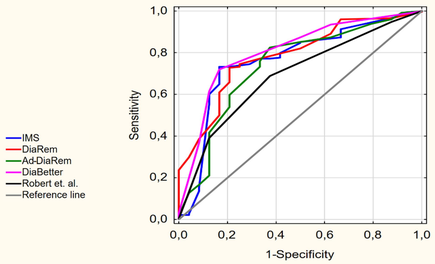
Tab. 3. The area under the receiver-operating characteristic curve analysis.

Model	AUROC (95% CI)	p-value	Cut-off	Sensitivity	Specitivity	PPV	NPV
IMS	0.76 (0.66-0.87)	<0.0001	≤78	0.73	0.83	0.98	0.25
DiaRem	0.78 (0.69-0.87)	<0.0001	≤10	0.73	0.79	0.97	0.24
Ad-DiaRem	0.74 (0.63-0.85)	<0.0001	≤13	0.83	0.63	0.95	0.27
DiaBetter	**0.81 (0.71-0.90)**	<0.0001	≤5	0.72	0.83	0.98	0.24
Robert	0.67 (0.58-0.80)	<0.0001	≥2	0.69	0.63	0.95	0.17

Fig. 5. Results of Hosmer-Lemeshow test.



Fig. 6. Receiver Operating Curves of models



Conclusions

- All proposed scores can be used in preoperative assessment of diabetes remission after bariatric surgery.
- DiaBetter score is significantly more accurate than scores proposed by other authors in predicting metabolic outcomes after bariatric surgery.
- Further external validation of examined scores at the international level is needed.

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