EE107

Internal Validation of the Metabo-Reno-Cardiovascular Disease Model: Cardiovascular outcomes in Type 2 Diabetes

Martins L, Ramos M, Lamotte M

Th(is)²Modeling, Asse, Belgium

ISPOR Congress, November 18-20 2024, Barcelona, Spain.

Background

- Several generic disease models have been developed in cardiovascular disease (CVD), diabetes, obesity and kidney disease.
- These diseases have common comorbidities; thus, most of these models describe all of them to some extent, with some limitations.
- To the best of our knowledge, the Metabo-Reno-Cardiovascular Disease Model (MRCDM) is the first model that fully integrates the impact of changes in all the appropriate risk factors on the different diseases, depending on the glycemic status and body weight.

Objectives

- This study aims to validate the prediction of CVD in individuals with type 2 diabetes (T2D) using the MRCDM.

Methods

- The MRCDM is a microsimulation model, with specific disease submodules and complications represented within a structure of Markov Health states.
- The starting individuals can be either with or without diabetes (type 1 or 2), obesity (defined by BMI), CVD and chronic kidney disease.
- To predict the risk of CVD in T2D in Western countries, different sets of risk equations are available: UKPDS82[1], Framingham[2-4] and the Swedish National Diabetes Registry (SweNDR) [5].
- The model was populated with UKPDS specific baseline characteristics[1] assuming no history of CVD.
- The UKPDS90[6] progression of risk factors equations and the UKPDS 82 combined mortality approach[1] were used.
- The observed UKPDS study[1] CVD outcomes over a 25-year time period were compared with the CVD cumulative incidences predicted with the different risk options.

Table 1 – MRCDM Cohort inputs

Baseline characteristics	Value
HbA1c (%)	7.08
Start age (y)	53.3
Duration of diabetes (y)	0
Proportion male	61%
SBP (mmHg)	135
DBP (mmHg)	82
Total cholesterol (mg/dL)	209
HDL (mg/dL)	41
LDL (mg/dL)	135
Triglycerides (mg/dL)	208
BMI (kg/m²)	27.5
eGFR (mL/min/1.73m²)	82

HbA1c: hemoglobin A1c, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HDL: High-density lipoprotein cholesterol, LDL: Low-density lipoprotein cholesterol, BMI: Body mass index, eGFR: Estimated glomerular filtration rate

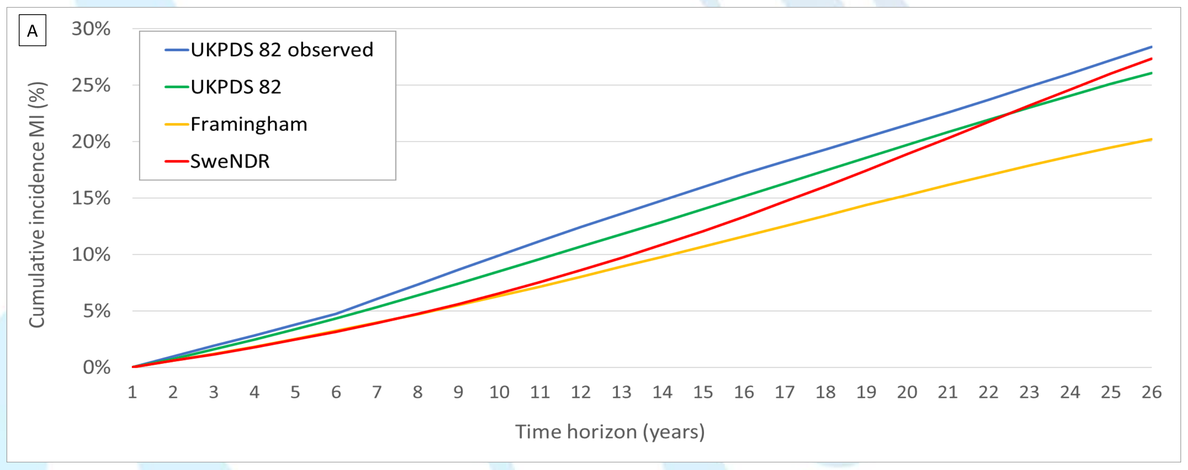
Table 2 – MRCDM predicted CVD cumulative incidence

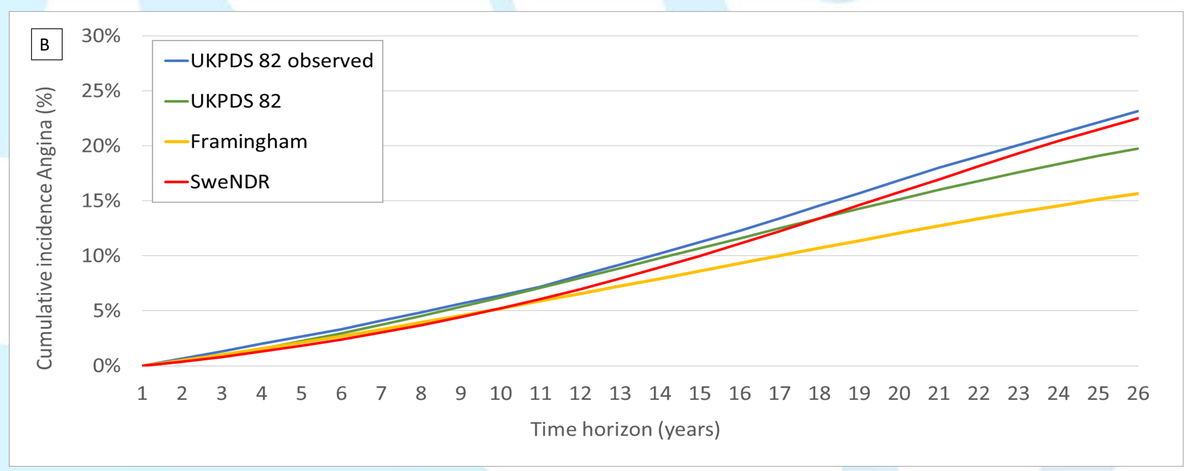
Outcome	MI	Angina	Stroke	Heart Failure
UKPDS observed	29%	23%	15%	11%
CVD equation				
UKPDS 82	26%	20%	15%	11%
Framingham	20%	16%	10%	17%
SweNDR	27%	23%	17%	13%

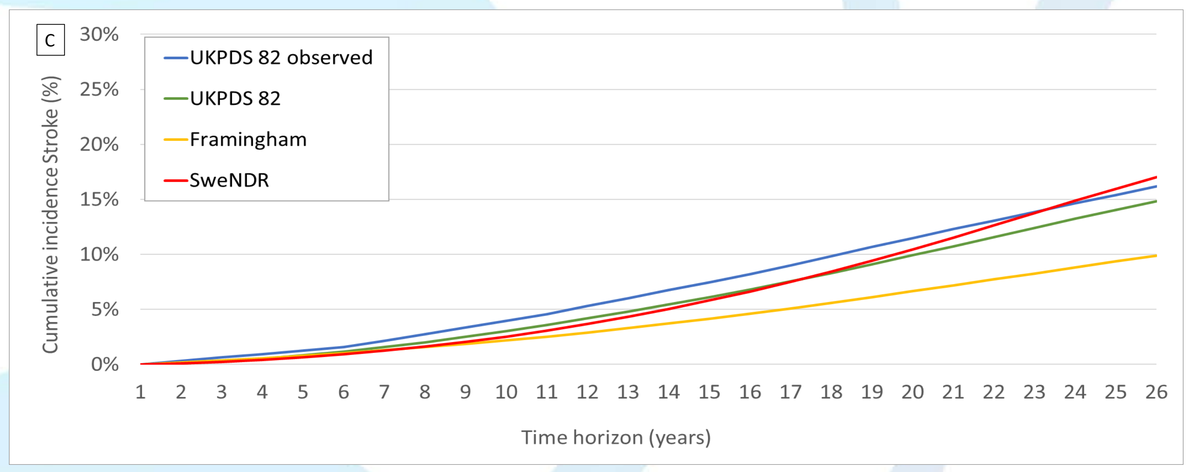
Results

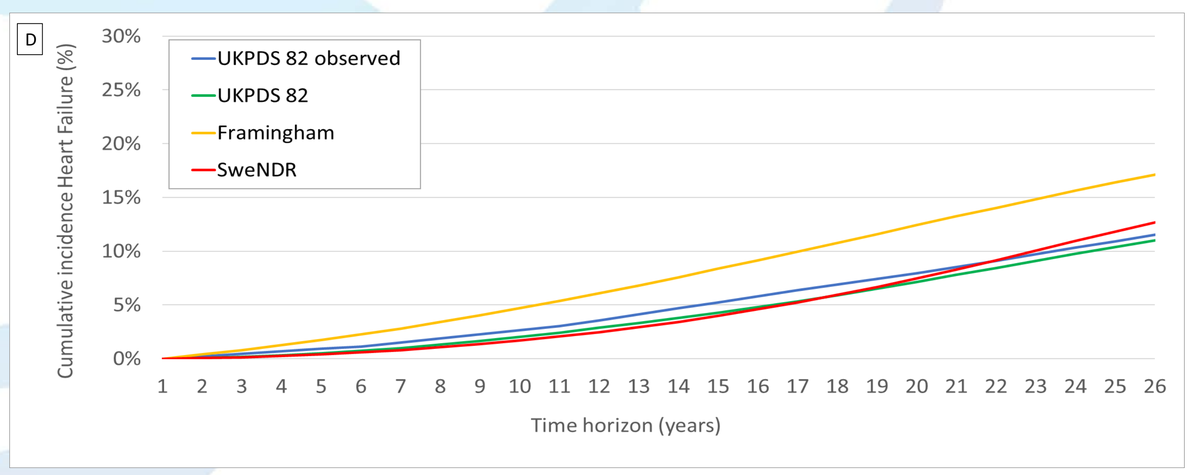
- In Figure 1, the observed and predicted cumulative incidence curves of MI (A), angina (B), stroke (C) and heart failure (D) are shown.
- In Table 2, the UKPDS 82 observed CVD cumulative incidence and the predictions obtained with three MRCDM risk options are shown, each covering different regions.
- The UKPDS 82 risk equations available in MRCDM are matching closely the observed data. With SweNDR similar predictions were observed. In the case of Framingham predictions, lower event rates were found, except for heart failure.

Figure 1 – MRCDM predicted Cumulative incidence of CVD events









Conclusions

- **In the MRCDM, UKPDS 82 risk equations predict similar vascular outcomes compared to the observed outcomes in the UKPDS 82 study.**
- **While the SweNDR predicts similar outcomes, Framingham differs importantly.**

Want to know more about the MRCDM? team@this2modeling.com

References

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