The Michigan Model for Coronary Heart Disease in Type 2 Diabetes: Development and Validation

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OBJECTIVES
The aim of this study was to develop and validate a computer simulation model for coronary heart disease (CHD) in type 2 diabetes mellitus (T2DM) that reflects current medical and surgical treatments.

RESEARCH DESIGN AND METHODS
We modified the structure of the CHD submodel in the Michigan Model for Diabetes to allow for revascularization procedures before and after first myocardial infarction, for repeat myocardial infarctions and repeat revascularization procedures, and for congestive heart failure. Transition probabilities that reflect the direct effects of medical and surgical therapies on outcomes were derived from the literature and calibrated to recently published population-based epidemiologic studies and randomized controlled clinical trials. Monte Carlo techniques were used to implement a discrete-state and discrete-time multistate microsimulation model. Performance of the model was assessed using internal and external validation. Simple regression analysis (simulated outcome = b(0) + b(1) × published outcome) was used to evaluate the validation results.

RESULTS
For the 21 outcomes in the six studies used for internal validation, R(2) was 0.99, and the slope of the regression line was 0.98. For the 16 outcomes in the five studies used for external validation, R(2) was 0.81, and the slope was 0.84.

CONCLUSIONS
Our new computer simulation model predicted the progression of CHD in patients with T2DM and will be incorporated into the Michigan Model for Diabetes to assess the cost-effectiveness of alternative strategies to prevent and treat T2DM.