

Several simple rules predicted complications in high-risk patients with diabetes

Selby JV, Karter AJ, Ackerson LM, Ferrara A, Liu J. Developing a prediction rule from automated clinical databases to identify high-risk patients in a large population with diabetes. *Diabetes Care*. 2001 Aug;24:1547-55.

QUESTION

What is the accuracy of a prediction rule for identifying patients with diabetes mellitus who are at high short-term risk for macro- and microvascular events, infectious disease, and metabolic complications?

DESIGN

A cohort of patients, randomly split into derivation and validation data sets.

SETTING

Kaiser Permanente health maintenance organization (HMO) in Oakland, California, United States.

PATIENTS

57 722 members of the HMO who were ≥ 19 years of age, had diabetes, and were continuously enrolled in the health plan during the 2-year baseline period. The derivation data set included 28 838 patients (mean age 61 y, 53% men), and the validation data set included 28 884 patients (mean age 61 y, 52% men).

DESCRIPTION OF PREDICTION GUIDE

A "best" model and 4 simpler approaches were derived: the previous events strategy (identifies patients with previous events or

related outpatient diagnoses during the baseline period), the first 3 variables of the "best" model, the numerical risk score (a summed score obtained by replacing significant model coefficients with integer values: 1.0 for a significant multivariate odds ratio [OR] between 1.1 and 1.49, 2.0 for an OR between 1.50 and 1.99, and 3.0 for an OR ≥ 2 , with corresponding negative numbers for significant ORs < 1.0), and ranking on the basis of average HbA_{1c} level during baseline.

MAIN OUTCOME MEASURES

Identification of patients at high short-term risk for macro- and microvascular, infectious, and metabolic complications.

MAIN RESULTS

Comparisons of the test properties of the various models for predicting each type of complication are summarized in the Table.

CONCLUSION

Simple prediction rules were better than HbA_{1c} levels for identifying patients with diabetes who were at high short-term risk for complications.

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Test properties of 5 models for predicting complications in diabetes (validation data set)*

Model	Types of complication											
	Micro- and macrovascular				Infectious disease				Metabolic			
	Sens	Spec	+LR	-LR	Sens	Spec	+LR	-LR	Spec	Spec	+LR	-LR
Best models†‡	72%	73%	2.68	0.38	72%	71%	2.49	0.39	83%	70%	2.79	0.24
Previous events	72%	72%	2.57	0.39	44%	86%	3.10	0.65	33%	99%	24.6	0.68
3 variables‡	71%	73%	2.63	0.40	68%	71%	2.35	0.45	75%	70%	2.52	0.35
Risk score‡	74%	70%	2.47	0.37	67%	71%	2.32	0.46	82%	71%	2.86	0.25
HbA _{1c} level‡	31%	70%	1.04	0.98	38%	70%	1.28	0.88	59%	70%	1.97	0.59

*Sens = sensitivity; spec = specificity. Diagnostic terms defined in Glossary. Data on specificity, +LR, and -LR provided by author.

†The "best" models for predicting complications included predictors from the following categories: patient demographics, previous diagnoses of complications, metabolic measurements, medications, and health care utilization measures.

‡Cut point of patients with the highest 30% of predicted risk scores.

COMMENTARY

The Diabetes Control and Complications Trial, the UK Prospective Diabetes Study, and other large randomized trials have shown that long-term metabolic control in patients with diabetes can reduce costs and complications. Despite this evidence, translating the beneficial effects of therapy to the real world of clinical practice has been a major challenge for the health care community. Selby and colleagues suggest that interventions targeting hospitalized patients with diabetes and patients with related diagnoses will have the greatest opportunity and power to show a short-term effect on care for persons with diabetes.

For patients who had not been hospitalized recently, clinical predictors included an elevated creatinine level, the use of > 1 antihypertensive medication, and the use of insulin. In the absence of additional clinical information, these predictors may act as surrogates for the duration of the diagnosis (1). This and other meta-data analysis strategies may hold promise in the quest for the optimal information systems and decision support. In the meantime, although only a few health systems may have integrated data sets that could identify patients at high risk

for diabetes complications, every health system could easily identify hospitalized patients with diabetes and plan, implement, and refine risk-reduction strategies targeting this group. An earlier report suggests that clinical systems fail to diagnose or document a previous diagnosis of diabetes in hospitalized patients (2). Reorganization of clinical systems across the continuum of care can be effective in the absence of high-technology information systems.

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References

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