Clinical prediction guide

Several simple rules predicted complications in high risk patients with diabetes

Selby JV, Karter AJ, Ackerson LM, et al. ***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?

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Design
A cohort of patients, randomly split into derivation and validation datasets.

Setting
Kaiser Permanente health maintenance organization (HMO) in Oakland, California, USA.

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 dataset included 28 838 patients (mean age 61 y, 53% men), and the validation dataset 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} concentration 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 summarised in the table.

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

COMMENTARY

The Diabetes Control and Complications Trial, the UK Prospective Diabetes Study, and other large randomised 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 treatment to the real world of clinical practice has been a major challenge for the healthcare community. Selby *et al* suggest that interventions targeting patients admitted to hospital with diabetes and patients with related diagnoses will have the greatest opportunity and power to show a short term effect on care for people with diabetes.

For patients who had not been admitted to hospital recently, clinical predictors included an elevated creatinine concentration, 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 datasets that could identify patients at high risk for diabetes complications, every health system could easily identify patients admitted to hospital 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 patients admitted to hospital.[2] Reorganisation of clinical systems across the continuum of care can be effective in the absence of high technology information systems.

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1 Clark CM Jr, Snyder JW, Meek RL, *et al.* A systematic approach to risk stratification and intervention within a managed care environment improves diabetes outcomes and patient satisfaction. *Diabetes Care* 2001;**24**:1079–86.
2 Levetan CS, Passaro M, Jablonski K, *et al.* Unrecognized diabetes among hospitalized patients. *Diabetes Care* 1998;**21**:246–9.

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

	Type of complication											
	Micro- and macrovascular				Infectious disease				Metabolic			
Model	Sens	Spec	+LR	–LR	Sens	Spec	+LR	–LR	Sens	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} concentration‡	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, medication, and healthcare utilisation measures.
‡Cut point of patients with the highest 30% of predicted risk scores.