RELIABILITY OF STATISTICAL MODELS TO PREDICT AN IgA NEPHROPATHY

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Background

The aim of our work was thus to compare performances of Bayesian network to performances of logistic regression to forecast an IgA nephropathy (IgAN) from simple clinical and biological criteria collected at a medical consultation.

Patients and Methods

Retrospective study ,149 patients
Renal biopsy between 2002 and 02/2010 in the "Clinique du Tonkin"

Naive architecture to build Bayesian graph
The sample was randomly separated in 2 halves:
- Half of the subjects were used for the knowledge base
- The model was then validated using the second half of the data.

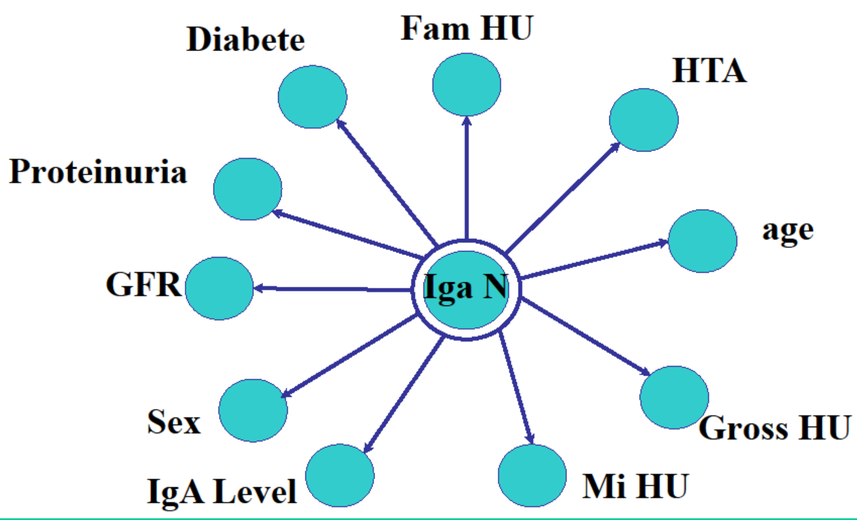
Statistics: ROC curve analysis

Characteristics of the subjects

Age (years)	mean ± SEM	48,2
	age < 40	36%
	40 < age < 60	34%
	age ≥ 60	30%
male		64%
HTA		44%
Microhematuria (Mi HU)		45%
Gross hematuria (HU)		17%
Family history of hematuria		3%
diabete		11%
Stage of CKD	II, I	53%
	III	31%
	IV, V	16%
Estimated GFR (MDRD ml/min/1,73 m²)	Mean ± SEM	63
Ig A plasma level	High	18%
	Normal	34%
	Not done	48%
Proteinuria (g/ 24 H)	prot <0.1	5%
	0,1 <prot < 1	28%
	1 < prot < 3	33%
	prot >=3	34%

Main histological reports
IgAN (30%),
Focal segmental glomerulosclerosis (15%), Minimal change glomerulonephritis (11%), vascular nephropathy (9%), interstitial nephritis (9%), membranous glomerulonephritis (6%), lupus nephritis (2%), diabetes nephropathy (4%), other diagnosis (14%).

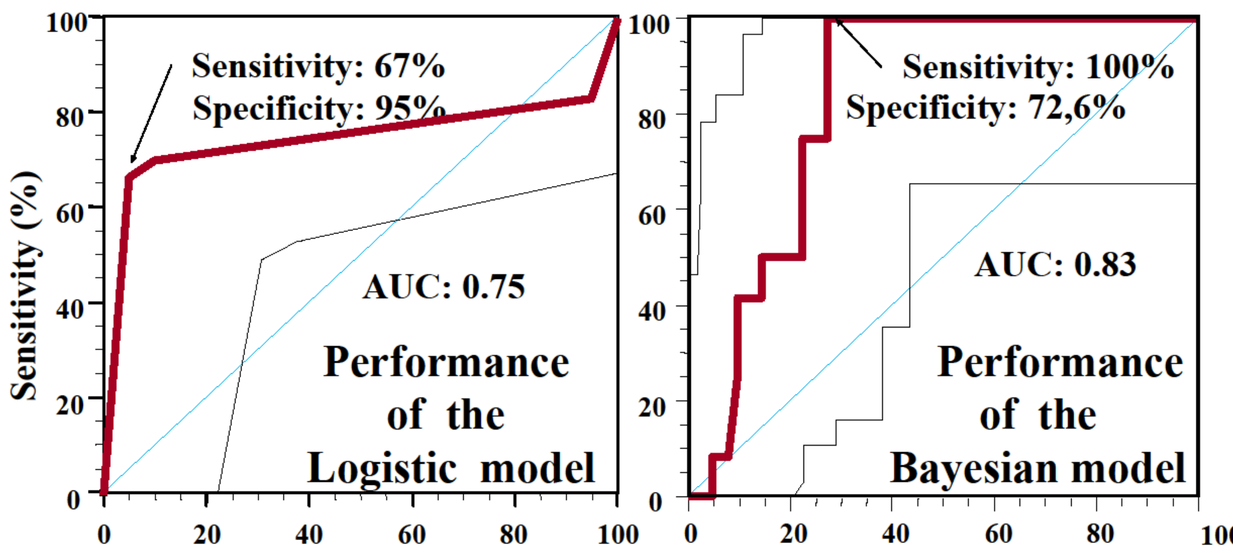
Bayesian network



Construction of the network

Group		learning (N=75)	Validation (N=74)	P
Number of IgA nephropathy		26 (35%)	18 (24%)	NS
Age (years)	Mean ±SEM	48,2 ± 2,06	48,2 ± 2,04	NS
	age < 40	28 (37%)	25 (34%)	NS
	40 < age < 60	26 (35%)	25 (34%)	
	age ≥ 60	21 (28%)	24 (32%)	
Male gender		44 (59%)	50 (68%)	NS
HTA		31 (41%)	35 (47%)	NS
Microhematuria		32 (43%)	34 (46%)	NS
Gross Hematuria		12 (16%)	13 (18%)	NS
Family history of hematuria		3 (4%)	1 (1%)	NS
Diabete		5 (7%)	12 (16%)	NS
eGFR (MDRD)	Mean ±SEM	62.1 ± 3,47	63.3 ± 3,46	NS
Stage of CKD	II , I	39 (52%)	42 (57%)	NS
	III	25 (33%)	21 (28%)	
	IV,V	11 (15%)	11 (15%)	
Ig A plasma level	High	14 (19%)	13 (18%)	NS
	normal	25 (33%)	26 (35%)	
	Not done	36 (48%)	35 (47%)	
Proteinuria (g/ 24 H)	prot <0.1	4 (5%)	3 (4%)	NS
	0,1 < prot < 1	21 (28%)	20 (27%)	
	1 < prot < 3	26 (35%)	24 (32%)	
	prot >=3	24 (32%)	27 (36%)	

ROC curve analysis



Receiver-operating-characteristic curves used to assess the predictive values of the 2 models to diagnose an IgAN in the validation sample. AUC means area under the curve.

Conclusion

A Bayesian network is at least as efficient as a logistic regression to estimate the probability of a patient suffering IgAN, using simple clinical and biological data obtained at consultation.

Thus, our proposed model must be regarded as a simple and helpful decision making tool in nephrology fields.

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