Les scores d'aide au diagnostic dans les méningites bactériennes : expérience chez l'adulte.

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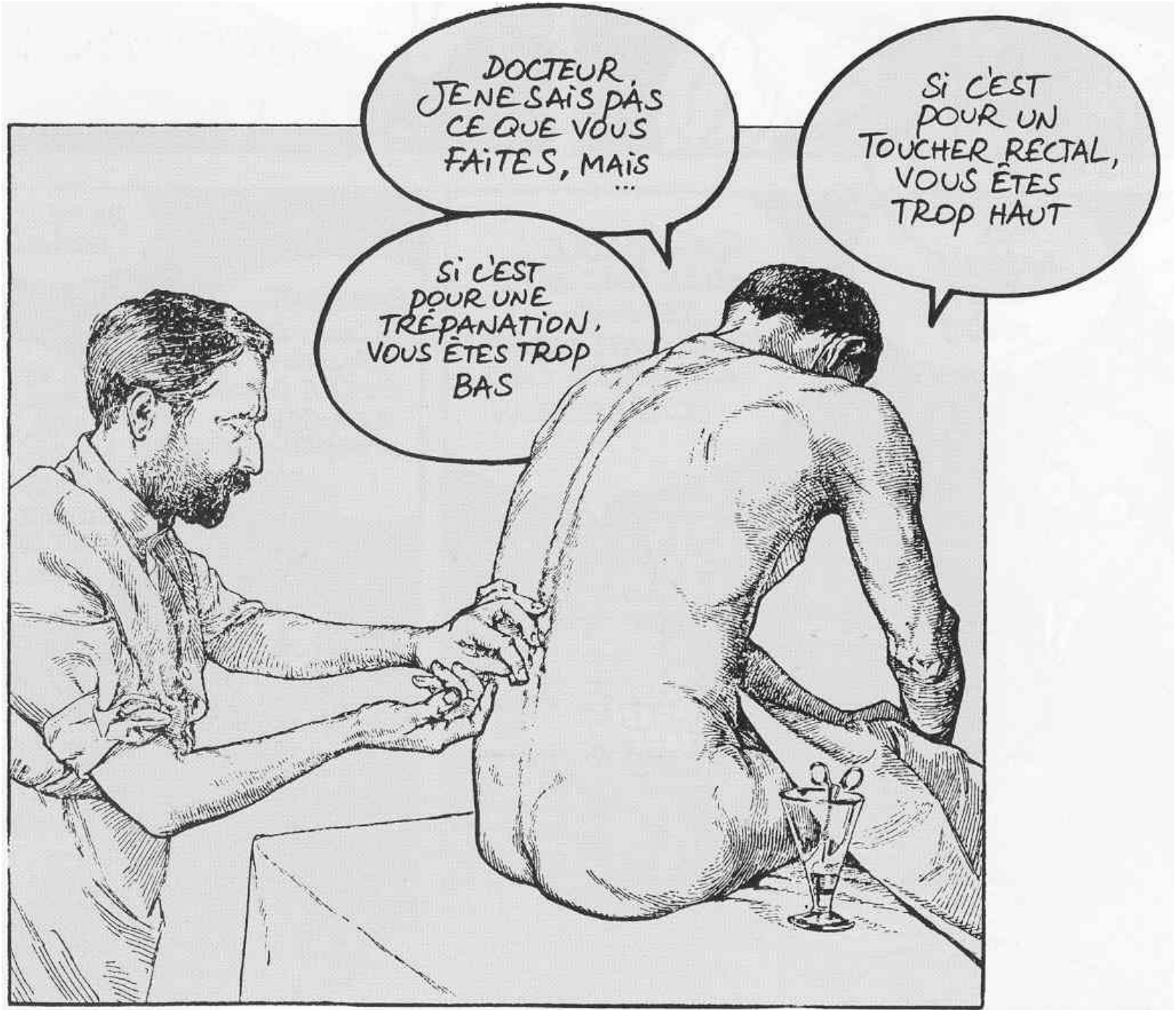

DOCTEUR JE NE SAIS PAS CE QUE VOUS FAITES, MAIS ...
SI C'EST POUR UNE TRÉPANATION, VOUS ÊTES TROP BAS
SI C'EST POUR UN TOUCHER RECTAL, VOUS ÊTES TROP HAUT

Contribution of CSF examination to the diagnosis of acute meningitis

	Bacterial meningitis (n = 115)		Viral meningitis (n = 283)		P value*
Age (years)	33.7 ± 23.2	(0.1–83)	18.0 ± 13.6	(1–66)	< .0001
Gender (M/F)	59/56		168/115		0.14
Leukocyte count (10^9/l)	19.9 ± 10.1	(4.5–52.7)	8.9 ± 3.4	(2.9–25.4)	< .0001
PMN count (10^9/l)	16.3 ± 9.1	(3.9–50.9)	6.2 ± 3.0	(1.2–23.0)	< .0001
Percent PMNs	82.7 ± 13.9	(10.0–97.0)	68.3 ± 13.0	(27.0–91.0)	< .0001
Blood glucose (mmol/l)	9.4 ± 4.8	(2.4–33.0)	5.3 ± 1.2	(2.7–9.6)	< .0001
CSF leukocyte count (10^6/l)	4990 ± 5000	(2.0–30000)	311 ± 400	(6–3500)	< .0001
CSF PMN count (10^6/l)	4750 ± 5026	(0–29700)	66 ± 134	(0–1260)	< .0001
Percent PMNs in CSF	83.6 ± 24.4	(0–100)	26.9 ± 29.3	(0–95)	< .0001
CSF protein (g/l)	3.6 ± 3.1	(0.2–20.0)	0.5 ± 0.3	(0.07–2.4)	< .0001
CSF glucose (mmol/l)	2.1 ± 2.2	(0–10.2)	3.1 ± 0.6	(1.1–4.7)	< .0001
CSF/blood glucose ratio	0.2 ± 0.3	(.001–2.3)	0.6 ± 0.2	(0.2–1.3)	< .0001

Hoen, Eur J Clin Microbiol Infect Dis 1995

The "Spanos" model JAMA, 1989, 262: 2700-2707.

- The probability of ABM versus AVM (pABM) is calculated according to the logistic model equation:
  - $pABM = 1/(1 + e^{-L})$, where

$L = 0.52 \times$ number of months from August 1
$- 12.76 \times$ CSF-blood glucose ratio
$+0.341 \times (\text{PMNs in CSF} \times 10^6/1)^{0.333}$
$+2.29 \times$ age $+ 2.79$ (if age ≤ 1 y),
$- 2.71 \times$ age $+7.79$ (if $1 \text{ y} < \text{age} \leq 2$ y),
$- 0.159 \times$ age $+ 2.69$ (if $2 \text{ y} < \text{age} \leq 22$ y) or
$+ 0.100 \times$ age $- 3.01$ (if age > 22 y).

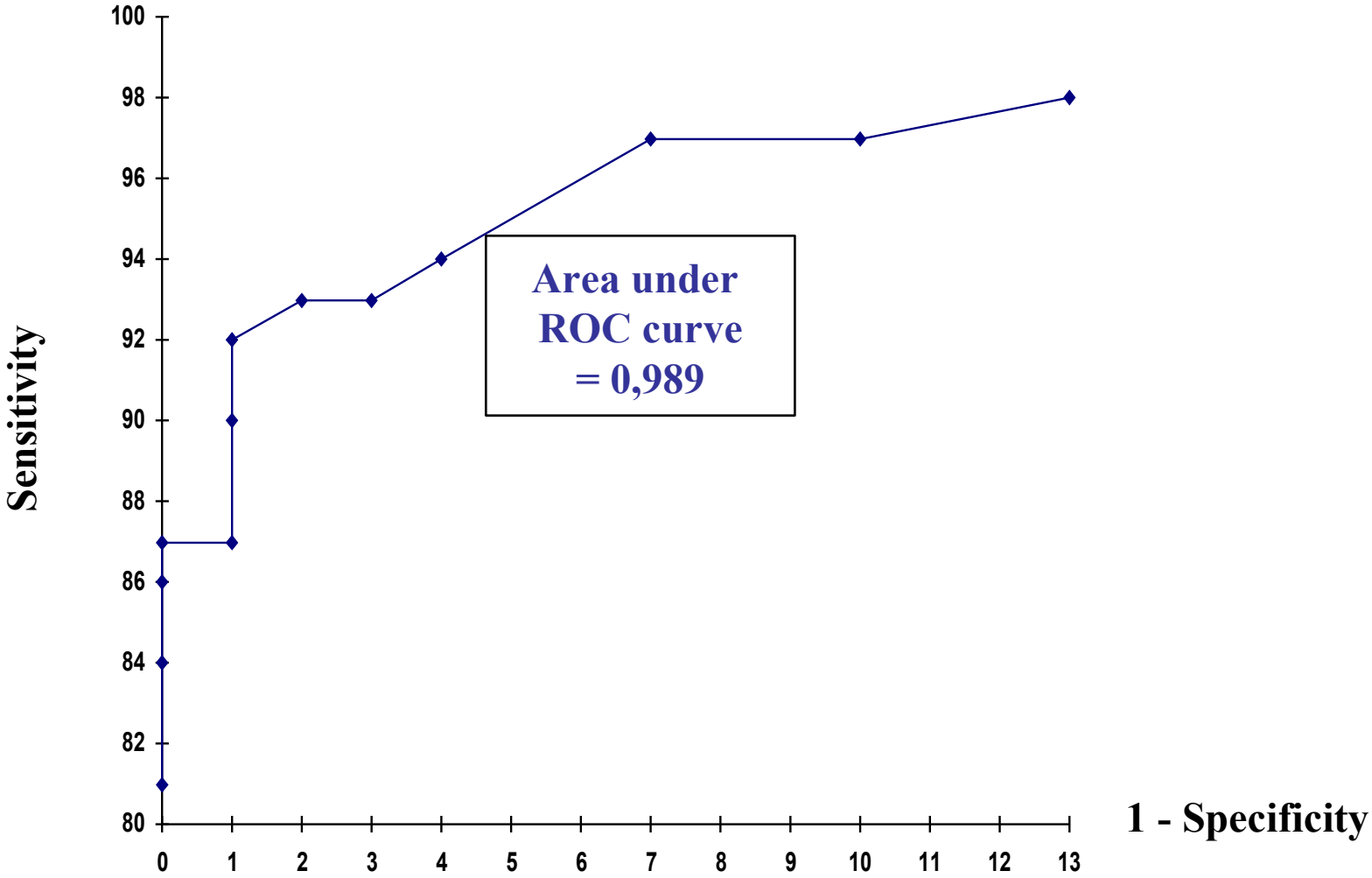
Personal model

- The model
  - 500 consecutive cases of acute primary meningitis (older than one month) from a single center
  - pABM = $1/(1+e^{-L})$, où :
    - L = 32,13 x 10^{-4} x nb. CSF PMN count (10^6 /l)
      + 2,365 x CSF protein (g/l)
      + 0,6143 x blood glucose (mmol/l)
      + 0, 2086 x WBC count (10^9/l) – 11
- Its performance indices: for pABM = 0,1
  Sensitivity = 97% NPV = 99%
  Specificity = 82% PPV = 85%
  AUC_{ROC} = 0,98

Hoen, Eur J Clin Microbiol Infect Dis 1995

$pABM_{hoen}$: choosing the appropriate cutoff value

pABM	Sensitivity	Specificity	Positive predictive value	Negative predictive value
0.05	98	87	76	99
0.075	97	90	80	99
0.1	97	93	85	99
0.2	94	96	90	98
0.3	93	97	92	97
0.4	93	98	95	97
0.5	92	99	96	97
0.6	90	99	97	96
0.7	87	99	97	95
0.8	87	100	100	95
0.9	86	100	100	95
0.95	84	100	100	94
0.99	81	100	100	93


Sensitivity
100
98
96
94
92
90
88
86
84
82
80
0
1
2
3
4
5
6
7
8
9
10
11
12
13
1 - Specificity
Area under
ROC curve
= 0,989

32-year-old male yuppie

- Acute febrile meningeal syndrome for 12 hours, on admission to ER
- CSF (slightly cloudy):
  - 700 WBC/mm^3 (525 PMN) – Gram stain negative
  - P 0.43 g/l, G 3.5 mmol/l
- Blood hematology and chemistry
  - WBC count 6300/mm^3
  - Glucose: 7 mmol/l – Serum C-RP: 25 mg/l
- To treat or not to treat?
  - $pABM_{hoen}$ = 0.064
  - Ab Rx was withheld
  - Apyrexia within 48 hours – Discharged by Day 4.

Prospective Validation of a Diagnosis Model as an Aid to Therapeutic Decision in Acute Meningitis

- 109 consecutive patients with acute meningitis and negative cerebrospinal fluid Gram stain.
- pABM was computed before therapeutic decision and diagnosis was established in 3 steps
  - Clinical: before pABM computation,
    bacterial, viral, uncertain
  - Computed: viral if pABM<0.1, bacterial otherwise
  - Definite: after discharge and review of patients' charts
    bacterial: positive cerebrospinal fluid culture;
    viral: negative CSF culture, no other etiology and no Rx;
    unknown: fitting neither of the first two

Baty, Eur J Clin Microbiol Infect Dis 2000

Prospective Validation of a Diagnosis Model as an Aid to Therapeutic Decision in Acute Meningitis

- Computed diagnoses were
  - viral in 78 of the 80 definite viral cases
  - bacterial in 4 of the 5 definite bacterial cases.
- Negative predictive value of the model was 98.7%
- Clinical diagnosis was uncertain in 22 cases
  - 15 of which were definite viral cases
  - in all of these 15 cases, computed diagnosis was viral, leading the physician to refrain from starting antibiotics in all of them.
- The model is reliable and helps physicians identify patients in whom antibiotics can be avoided safely.

Baty et al. Eur J Clin Microbiol Infect Dis 2000

Validation of a diagnosis model for differentiating bacterial from viral meningitis in infants and children under 3.5 years of age

Distribution of the causative microorganisms in 103 cases of acute meningitis

Causative microorganism	Cases (n)
Bacterial ($n = 48$)	
Haemophilus influenzae	33
Neisseria meningitidis	11
Streptococcus pneumoniae	4
Viral ($n = 36$)	
Mumps virus	3
Enterovirus	2
Herpes zoster virus	1
Unidentified	30
Undetermined ($n = 19$)	

Jaeger et al. Eur J Clin Microbiol Infect Dis 2000

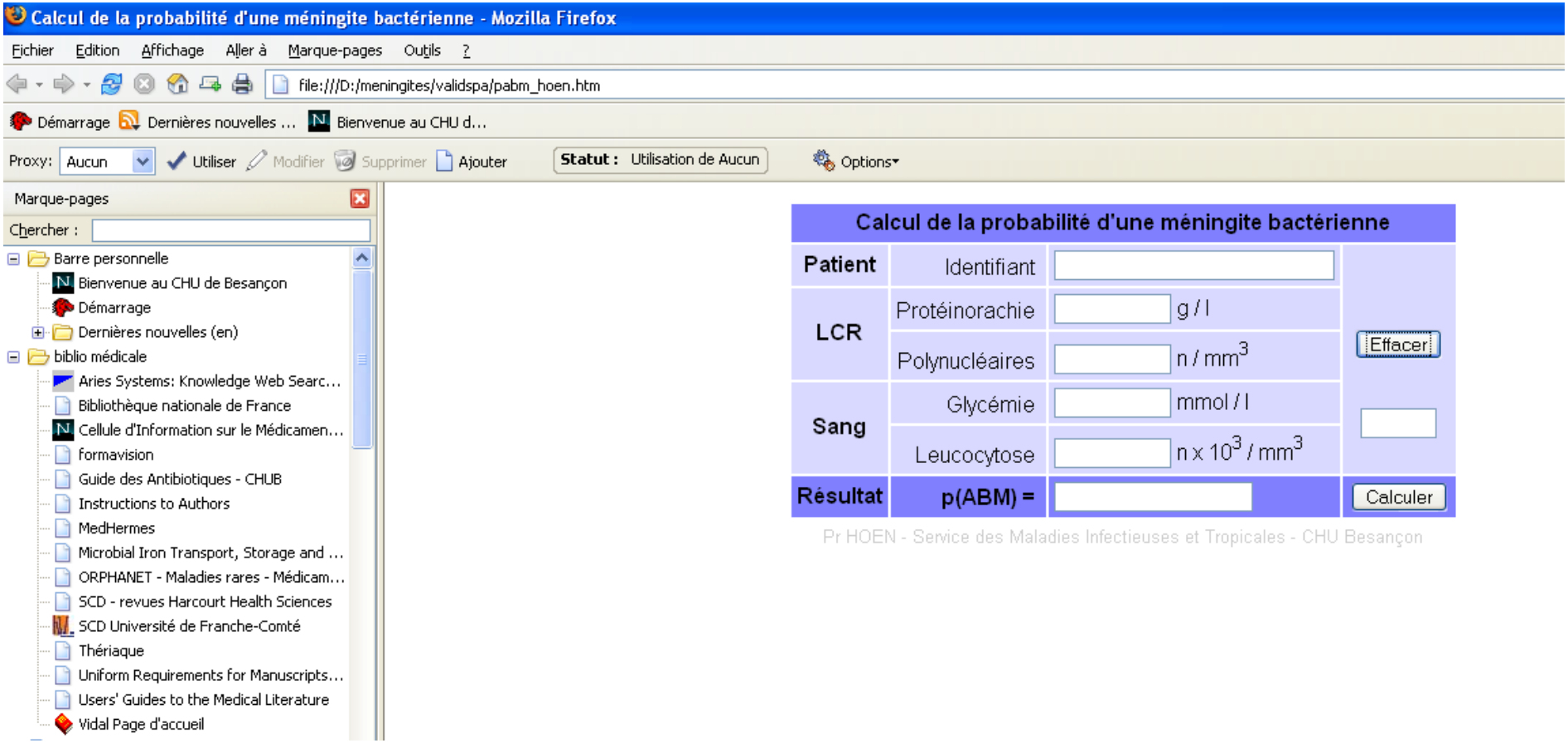
Validation of a diagnosis model for differentiating bacterial from viral meningitis in infants and children under 3.5 years of age

Performance of the model for different cut-off points of the probability of bacterial meningitis (pABM).

pABM	Sensitivity	Specificity	PPV	NPV	Accuracy
0.05	97.9	88.9	92.2	97.0	94.0
0.1	97.9	94.4	95.9	97.1	96.4
0.2	91.7	97.2	97.8	89.7	94.0
0.3	89.6	100	100	87.8	94.0

Jaeger et al. Eur J Clin Microbiol Infect Dis 2000

On-line, intranet-based calculation of pABM



Acknowledgment: Alain Dussaucy, MD

Damien, 15 ans, collégien

- 1 octobre 2003 : syndrome méningé aigu fébrile évoluant depuis 8 heures au moment de la PL – pas de purpura
- PL: LCR clair, 185 GB/mm^3, 70% PNN, P 0.7 g/l, G 3.1 mmol/l
- GB : 15000/mm^3, 91% PNN, CRP 15 mg/l
- Procalcitonine : 5 ng/ml
- Traitement par Ceftriaxone (en attendant PCR/LCR)
- $pABM_{hoen}$ = 0,06
- J5 : cholécystite aiguë
- J7 : diagnostic étiologique
  - Recherche virus gorge et selles positive à enterovirus.
  - PCR méningocoque négative

Recommendations for an appropriate use of the model

- The model is accurate, reliable and can help physicians identify patients in whom antibiotics can be avoided safely, especially in situations where initial diagnosis is uncertain.
- Model-derived pABM is a probability, only a probability, not the final answer.
- pABM should be regarded as one piece of diagnostic information among others and should never be substituted entirely for a careful diagnostic evaluation of each individu al case.