test results. Forcing dichotomisation on multicategory test results may discard useful diagnostic information.

Likelihood ratios can be used to help adapt the results of a study to your patients. To do this they make use of a mathematical relationship known as Bayes theorem that describes how a diagnostic finding changes our knowledge of the probability of abnormality.³ The post-test odds that the patient has the disease are estimated by multiplying the pretest odds by the likelihood ratio. The use of odds rather than risks makes the calculation slightly complex (box) but a nomogram can be used to avoid having to make conversions between odds and probabilities (figure).⁷ Both the figure and the box illustrate how a prior probability of obstructive airway disease of 0.1 (based, say, on presenting features) is updated to a probability of 0.7 with the knowledge that the patient had smoked for more than 40 pack years.

In clinical practice it is essential to know how a particular test result predicts the risk of abnormality. Sensitivities and specificities¹ do not do this: they describe how abnormality (or normality) predicts particular test results. Predictive values² do give probabilities of abnormality for particular test results, but depend on the prevalence of abnormality in the

study sample and can rarely be generalised beyond the study (except when the study is based on a suitable random sample, as is sometimes the case for population screening studies). Likelihood ratios provide a solution as they can be used to calculate the probability of abnormality, while adapting for varying prior probabilities of the chance of abnormality from different contexts.

- 1 Altman DG, Bland JM. Diagnostic tests 1: sensitivity and specificity. *BMJ* 1994;308:1552.
- 2 Altman DG, Bland JM. Diagnostic tests 2: predictive values. *BMJ* 1994;309:102.
- 3 Sackett DL, Straus S, Richardson WS, Rosenberg W, Haynes RB. *Evidence-based medicine. How to practise and teach EBM*. 2nd ed. Edinburgh: Churchill Livingstone, 2000:67-93.
- 4 Jaeschke R, Guyatt G, Lijmer J. Diagnostic tests. In: Guyatt G, Rennie D, eds. *Users' guides to the medical literature*. Chicago: AMA Press, 2002:121-40.
- 5 Straus SE, McAlister FA, Sackett DL, Deeks JJ. The accuracy of patient history, wheezing, and laryngeal measurements in diagnosing obstructive airway disease. CARE-COAD1 Group. Clinical assessment of the reliability of the examination-chronic obstructive airways disease. *JAMA* 2000;283:1853-7.
- 6 Altman DG. Diagnostic tests. In: Altman DG, Machin D, Bryant TN, Gardner MJ, eds. *Statistics with confidence*. 2nd ed. London: BMJ Books, 2000:105-19.
- 7 Fagan TJ. Letter: Nomogram for Bayes theorem. *N Engl J Med* 1975;293:257.

A memorable patient

Living history

I was finally settling down at my desk when the pager beeped: it was the outpatients' department. An extra patient had been added to the afternoon list—would I see him?

The patient was a slightly built man in his 60s. He had brought recent documentation from another hospital. I asked about his presenting complaint.

"Well, I'll try, but I wasn't aware of everything that happened. That's why I've brought my wife—she was with me at the time."

This was turning out to be one of those perfect neurological consultations: documents from another hospital, a witness account, an articulate patient. The only question would be whether it was seizure, syncope, or transient ischaemic attack. As we went through his medical history, I studied his records and for the first time noticed the phrase "Tetralogy of Fallot."

"Yes, my lifelong diagnosis," he smiled. "I was operated on."

I saw the faint dusky blue colour of his lips. "Blalock-Taussig shunt?" I asked, as dim memories from medical school somehow came back into focus.

"Yes, twice. By Blalock." He paused. "In those days the operation was only done at Johns Hopkins—all the patients went there. I remember my second operation well. I was 12 at the time."

"And the doctors?" I asked.

"Yes, especially Dr Taussig. She would come around with her entourage every so often. Deaf as a post, she was."

"What? Taussig deaf?"

"Yes. She had an amplifier attached to her stethoscope to examine patients."

I asked to examine him, only too aware that it was more for my benefit than his.

A half smile suggested that he had read my thoughts: "Of course."

To even my unpractised technique, his cardiovascular signs were a museum piece: absent left subclavian pulse, big arciform scars on the anterior chest created by the surgeon who had saved his life, central cyanosis, right-sided systolic murmurs, loud pulmonary valve closure sound (iatrogenic pulmonary hypertension, I reasoned), pulsatile liver—all these and undoubtedly more noted by the physician who first understood his condition.

That night, I read about his doctors. Helen Taussig indeed had had substantial hearing impairment, a disability that would have meant the end of a career in cardiology for a less able clinician. I also learnt of the greater challenges of sexual prejudice that she fought and overcame all her life. I learnt about Alfred Blalock, the young doctor denied a residency at Johns Hopkins only to be invited back in his later years to head its surgical unit.

The experiences of a life in medicine are sometimes overwhelming. For weeks, I reflected on the perspectives opened to me by this unassuming patient. The curious irony of a man with a life threatening condition who had outlived his saviours; the extraordinary vision of his all-too-human doctors; the opportunity to witness history played out in the course of a half-hour consultation. And memories were jogged, too: the words of my former professor of medicine, who showed us cases of "Fallot's" and first told us about Taussig, the woman cardiologist; the portrait of Blalock adorning a surgical lecture theatre in medical college.

(And my patient's neurological examination and investigations? Non-contributory. I still don't know whether it was seizure, syncope, or transient ischaemic attack.)

Giridhar P Kalamangalam *clinical fellow in epilepsy, department of neurology, Cleveland Clinic Foundation, Cleveland OH, USA*