European Heart Journal (1997) **18**, 1527

The ultimate interventional cardiologist — a computer

See page 1611 for the article to which this Editorial refers

Remember the times when a bedside argument about the origin of a cardiac murmur was invariably won by the most senior internist or cardiologist! Experience and rank defined the gold standard. But where did this experience come from? Partly it came from an even senior cardiologist who had handed the gold standard over.

Then came Doppler ultrasound as the new gold standard, putting even the most senior cardiologist in the wrong, not all the time, not very often, but regularly.

In analogy, we are in a pre-ultrasound era with interventional cardiology. The fundamental decision 'to dilate or not to dilate' is influenced by a number of things. There are large (multicentre) studies showing which patients are at risk during coronary angioplasty, but their inclusion and exclusion criteria are often so stringent that their value for everyday practice is questionable. Furthermore, their data leave ample room for personal interpretation, so that the final decision is often strongly influenced by local rites and beliefs, personal experience and mood of the operator, time constraints, or pecuniary considerations, to name just a few.

We desperately need a computerized expert system than can project the risk of an intervention in every single case. It has to be fed by the knowledge of previous studies, and — more importantly — it has to be intelligent, self-learning and must be able to adapt itself to the conditions (patient population, techniques applied, etc.) germane to the centre where it is used.

The paper presented by Budde *et al.* in this issue[1] describes such a system. Developed at the Laboratory for Artificial Intelligence in Bremen, it works against a mathematical background which is hardly accessible for the non-initiated. The explanations given by the authors change little of that fact. Looking at it as a black box, however, the system is amazingly simple: one enters patient variables like age, sex, angina class, site and morphology of a stenosis, etc. and finally the outcome of the intervention. The system is then capable of sorting out risk factors for a poor outcome from percutaneous transluminal coronary angioplasty. The more patients entered, the more accurate the predictions will get. If circumstances change, like for instance the introduction of a new interventional method or a shift in the characteristics of the patients referred, the program will automatically adapt itself to these changes. Similar systems have already been tested in other fields of medicine with good success[2–6].

The results presented by Budde *et al.*[1] are most convincing. The 2500 data items entered per patient in a bout of (German) overzeal are overwhelming. Comfortingly, the computer algorithm reduced them down to only 40 that were of real importance. Furthermore, the computer detected, more or less, the risk factors that were known from previous studies, proving that the algorithm works. But the most amazing part is that these risk factors were detected by analysing only 455 consecutive, absolutely non-selected patients. In contrast, most of what we know in interventional cardiology up to now, has been obtained by huge, expensive multicentre studies in highly selected patients.

So we hold in our hands a tool that will tell us before an intervention the probability of success. In a time of ever-increasing financial pressure on medicine this is a practical and easy method for quality assurance and it can act as a quick and cost-effective 'expert' in all cases should we need to defend our actions in front of the health insurance or other authority.

Is it ethical, to put the fate of a patient in the hands, or rather the circuitry, of a computer? Well, it is too late to decide. Our lives and those of our patients are governed by chips quite frequently already, for instance, when a patient is pacemaker-dependent, when we trust the computerized brakes of our cars or when an airplane lands safely in the heart of a foggy city.

M. FLEISCH
B. MEIER
Inselspital,
Bern, Switzerland

References

[1] Budde T, Haude M, Höpp HW *et al* A prognostic computer model to predict individual outcome in interventional cardiology. The INTERVENT Project. Eur Heart J 1997; 18. 1611–19.
[2] Uckun S. Intelligent systems in patient monitoring and therapy management. A survey of research projects. Int J Clin Monit Comput 1994; 11: 241–53.
[3] Dojat M, Harf A, Touchard D, Laforest M, Lemaire F, Brochard L. Evaluation of a knowledge-based system providing ventilatory management and decision for extubation. Am J Respir Crit Care Med 1996; 153: 997–1004.
[4] Ebell MH. Artificial neural networks for predicting failure to survive following in-hospital cardiopulmonary resuscitation. J Fam Pract 1993; 36: 297–303.
[5] Lamb DJ, Niederberger CS. Artificial intelligence in medicine and male infertility. World J Urol 1993; 11: 129–36.
[6] Lette, Coletti BW, Cerino M *et al.* Artificial intelligence versus logistic regression statistical modelling to predict cardiac complications after noncardiac surgery. Clin Cardiol 1994; 17: 609–14.