Broadening medical horizons

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In the rush to acquire ever more and detailed knowledge, the medical profession appears to have forgotten that there are other academic disciplines, the study of which would benefit both doctors and patients.

Subspecialization has been the inevitable consequence of the explosion in the medical knowledge base. Although it can have advantages, such as for low volume operations (Bachmann et al, 2002), it can have negative consequences as well. It can cut doctors off from each other and indeed from patients. It may also suppress innovative thinking, as people become locked into the prevailing scientific and medical paradigms.

Studying the humanities can help doctors balance medicine's scientific basis with their patient's human needs. Beneficial application of the powerful tools of the pure sciences will only come about if doctors know about and understand them.

THE HISTORY OF MEDICINE

To forget history in our efforts to advance medical science is to lose valuable lessons and possibly even to hinder progress. The latter can be illustrated by the sorry tale of thrombolysis and glucose-insulin-potassium (GIK) for acute myocardial infarction (MI), and the former by the death of a volunteer in a drug trial.

It is not widely appreciated that streptokinase was first introduced in the late 1950s as it was not for a further three decades that its full impact was finally realized. Sadly, in the rush to participate in the thrombolytic renaissance brought on with the rediscovery of streptokinase another effective treatment (GIK) was forgotten. That an infusion of GIK could shorten the evolution of an acute MI, reduce the incidence of ventricular ectopy and improve early survival in acute MI was first recognized 40 years ago. However, it was only in 1998 with the publication of the Estudios Cardiologicos Latinoamerica glucose-insulin potassium (ECLA-GIK) pilot study (Diaz et al, 1998) that its effectiveness in a randomized controlled trial was finally seen. This benefit was apparent in all patients, including those who were thrombolysed.

The valuable lessons of history are no better, or tragically, illustrated than by the recent death of a healthy 24-year-old. This woman died after inhaling hexamethonium in a clinical trial, despite the fact that the fatal effects of the drug on the lung have been known about for many years. The problem is that the papers on the subject were published in the early 1960s. Hardly historical you might think but, unfortunately for this particular girl, medical history only starts in 1966, this being the earliest year from which papers are cited in Medline.

PHILOSOPHY

Philosophy, like medicine, is a large and often difficult subject. One of the reasons for this is because it deals with difficult issues encompassing life, death and everything else in between. These are issues that doctors deal with on a daily, real-life basis.

Simon Blackburn, a professor of philosophy at Cambridge, points out that philosophical conundrums can be 'baffling' and 'defy simple processes of solution' (Blackburn, 2001). Similarly, patients can baffle us and illnesses can defy simple solutions. It is in these atypical cases that a capacity for more abstract or lateral thinking, potentially acquired through the study of philosophy, can be of help.

Blackburn also suggests that:

> **'...philosophy studies the structure of thought. Understanding the structure involves seeing how the parts function and how they interconnect.'**

An understanding of the structure of thought can provide a meaningful framework with which to order our knowledge and thinking. The need for such a framework increases along with the exponential growth of the medical corpus.

One specific 'philosophy' that has a bearing on our daily work is that of 'humanism'. Medicine is a balancing act: between effect and side effect, between cost and benefit and even between life and death. Science tells us about the

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structure of the body and the cause and treatment of disease. However, it does not teach us how to make value judgments about people's lives. Humanism looks at the people behind the scientific screen, thereby giving us a view of the whole patient. It is after all, the whole patient that ultimately needs to be treated rather than just their physiological imbalance.

Conversely, philosophy can also give scientific insights. Thomas Kuhn's seminal work, *The Structure of Scientific Revolutions* (Kuhn, 1962), has been described as 'the most influential book in modern philosophy of science' (Honderich, 1995). His investigations into the history of scientific discovery lead him to the conclusion that science does not just slowly evolve. Instead, it has periods of turmoil where fundamental precepts are turned on their heads (the change from the 'miasma' theory of contagion to the pathogenicity of bacteria) followed by times of hypothesis refinement (which bacteria cause what, and how). The importance of recognizing this pattern is that it allows one to be sensitive to such changes when they come along. It also means that if one comes across anomalies in one's own work, one should not immediately dismiss them, but pursue them that bit further.

NUMERACY

Although a knowledge of differential calculus, for example, is of no direct relevance or use to most of the medical profession, all doctors are constantly bombarded with numbers. Nowadays most have at least a rudimentary grounding in statistics, but figures can be deceptive in sneaky ways they did not tell you about at medical school.

Not only can numbers be deceptive, but they do not always tell the whole story. Virginia Bottomley was a minister at the British Home Office when she produced this statistic: '93% of the British population, both employed and unemployed, have colour televisions, washing machines and freezers.' Surely a sign of a healthy, affluent society? Her baffled comment was: 'Why on earth isn't everybody happy?' Objectively, this figure suggests that the country has reached a high level of prosperity. However, it appears that people always want something more, or something different. This can be seen in the realm of health care as well. It has been reported that people's perception of their own health is inversely proportional to the amount of money spent on their health-care system (Sen, 2002). The figures do not seem to correlate with the reality.

The psychologists Tversky and Kahneman (1981) set the following problem to a wide variety of people:

The government is preparing for an epidemic of an infectious disease. This outbreak is expected to kill 600 people.

The first group was told that they had to choose between programme A, which would save exactly 200 people, and programme B, where there was a one third probability that everybody would be saved; 72% chose programme A.

The second group was told that programme A would result in 400 deaths and programme B had a one third probability that no one would die; 78% chose programme B.

This shows the dramatic effect of the same data being presented in different ways. Doctors, despite their training in statistics, were no different from the rest of the population. This also demonstrates how easy it is for numbers to be wittingly manipulated or unwittingly biased.

Science and computers digitalize the world into one and zero, black and white. However, life exists in shades of grey. Fuzzy logic is a variation of conventional logic that handles 'partial truth'. It allows the user to digitally manipulate the area between '1' and '0' or 'completely true' and 'completely false'. The application of fuzzy logic demonstrates how numbers can be processed. Its application allows us to process numbers to our and our patients' benefit. For example, it could make the difference between prescribing a sliding scale for the administration of insulin (if the blood glucose is 0–4 mmol/litre then infuse 0.5 units of insulin/hour) and adjusting the infusion to achieve target blood glucose levels (insulin infusion 1–10 U/hour to achieve a blood glucose level of 4–5 mmol/litre). The latter should achieve the clinically significant goal of tighter glycaemic control far better than the former.

PHYSICS

Medical science continues to look at smaller and smaller entities: from cells to receptors to receptor sub-types and so on. However, this tells us very little about the interaction between mind and body, human suffering or patients' perceptions of disease.

In terms of reductionism physics is a long way ahead of medicine. Quantum theory deals with entities at least 100 million times smaller than atoms. It is an area where nothing is determinate and everything is probabilities. However, there is a strong concern that this does not actually tell us very much about the real world: a world that contains such disparate and non-uniform things as weather and rainforests.

Chaos theory may bridge that gap. The firing of a single neurone is pretty straightforward and

predictable. However, put billions of neurones together in a brain and their firing patterns appear to be random. Chaos theory shows how patterns can emerge from this apparent disorder. This can be seen in the Mandlebrot set (one of the first group of patterns discerned in this field), the development of fern leaves and, of particular relevance, the natural history of breast cancer (Baum et al, 1999).

CONCLUSIONS

It is futile to expect medical students to attain a detailed understanding of every specialty during their training. The study of both the humanities and non-medical sciences provides a perspective which can help in the organization of this vast quantity of knowledge.

Study of the sciences can catalyse innovation by providing a glimpse of the potential that other disciplines hold. However, as the modern novelist Robertson Davies pointed out, students arrive on their first day at medical school 'already worshippers of the science snake' (Davies, 1996). This implies that the sooner they are introduced to the humanities in a medical context, the better. Indeed, the new Peninsula medical school has indicated that the humanities will form an important part of their undergraduate course.

In more established institutions curriculum change is notoriously difficult to achieve. In the first instance this problem may be overcome by allowing the student some degree of choice through 'special study modules'. Medical schools are rarely the isolated institutions that many once were. The vast intellectual resources of the universities are there, waiting to be tapped.

In time, as the benefits filter through, maybe both undergraduate and postgraduate medical education will become broader in its scope and more flexible in its approach. HM

Conflict of interest: none.

Bachmann MO, Alderson D, Edwards D, Wotton S, Bedford C, Peters TJ, Harvey IM (2002) Cohort study in South and West England of the influence of specialization on the management and outcome of patients with oesophageal and gastric cancers. *Br J Surg* **89**(7): 914–22

Baum M, Chaplain MA, Anderson AR, Douek M, Vaidya JS (1999) Does breast cancer exist in a state of chaos? *Eur J Cancer* **35**(6): 886–91

Blackburn S (2001) *Think: A Compelling Introduction to Philosophy.* Oxford University Press, Oxford

Davies R (1996) *The Merry Heart Selections 1980-1995.* McClelland & Stewart, Toronto

Diaz R, Paolasso EA, Piegas LS et al (1998) Metabolic modulation of acute myocardial infarction. The ECLA (Estudios Cardiologicos Latinoamerica) Collaborative Group. *Circulation* **98**(21): 2227–34

Honderich T (1995) *The Oxford Companion to Philosophy.* Oxford University Press, Oxford

Kuhn TS (1962) *The Structure of Scientific Revolutions.* University of Chicago Press, Chicago

Sen A (2002) Health: perception versus observation. *BMJ* **324:** 860–1

Tversky A, Kahneman D (1981) The framing of decisions and the psychology of choice. *Science* **211**(4481): 453–8

Further reading

Ackerknecht EH (1982) *A Short History of Medicine.* Johns Hopkins University Press, Baltimore

Botton AD (2000) *The Consolations of Philosophy.* Hamish Hamilton, London

Boyle D (2000) *The Tyranny of Numbers: Why Counting can't make us Happy.* Harper Collins, London

Brandt AM (1987) *No Magic Bullet: a Social History of Venereal Disease in the United States since 1880.* Oxford University Press, New York

Dunbar RI (1995) *The Trouble with Science.* Faber, London

Gleick J (1987) *Chaos: Making a New Science.* Penguin Books, Harmondsworth

Kosko B (1993) *Fuzzy Thinking: the New Science of Fuzzy Logic.* Harper Collins, London

Polkinghorne JC (2002) *Quantum Theory: a Very Short Introduction.* Oxford University Press, Oxford

Porter R (1999) *The Greatest Benefit to Mankind: a Medical History of Humanity from Antiquity to the Present.* Fontana Press, London

KEY POINTS

- Medicine eventually embraces all people and all issues, so a broad perspective is essential to good practice.
- History provides background, perspective and valuable lessons.
- Philosophy helps in understanding both people and science.
- Numbers hide as much as they clarify.
- The development of physics shows how the connections are as important as the fundamentals.
- No more than an awareness of the issues generated by these other subjects is needed to benefit medical practice.