The modern scientific physician: 2. Medical science versus scientific medicine

Olli S. Miettinen

Sharply contrasting with the Aesculapian god-physician, his Hippocratic contemporary was learned, wise, modest and humane.[1] These qualities defining the Hippocratic ideal remain unquestioned for today's purposes just the same, but realizing them has become more challenging upon the advent of medical science. Learnedness is strained in attempting to apprehend the concept of science; modesty is brought into question by the affected habit of wearing the scientist's laboratory coat; both learnedness and modesty are wanting when actually confusing the practice of scientific medicine with medical science itself; modesty together with humaneness are threatened by the role of medical science in providing for the arrogant claims of "cultural authority" for medicine[2] and of medical knowledge being beyond the reach of lay understanding[2]; and wisdom is challenged to understand "the ends of life" in the context of the expanded opportunities brought about by increase in knowledge.[3]

The famous Flexner report that defined medical education for the United States and Canada in 1910 drew its ideas principally from the culture that prevailed at Johns Hopkins University at the time, with Osler among its illustrious leaders in medicine. According to that report, "The essence of science is its method, — the painstaking collection of all relevant data, the severe effort to read their significance in connection."[4] The report propagated the idea that the then-modern — avant-garde, actually — practice of medicine had this very essence, and that it therefore was not merely scientific but indeed science proper. For example, the essence of diagnosis that qualified it as science was said to be its requisite degree of "caution and thoroughness" with which "observations are made, inferences are drawn, and the results are heeded."[4] This conception of the essence of science contrasts sharply with that in the philosophy of science.[5]

Leaders of today's Evidence-based Medicine (EBM) movement explain their idea about modern practice vis-à-vis science in a textbook of "clinical epidemiology"[6]: "At different times, and in different situations, it dawned on each of us that there was, in fact, a science to the art of medicine," namely "clinical epidemiology," a source of *principles* to guide diagnosis and prognosis (including as to intervention effects) and thus a "basic science" for clinical practice.[7] Diagnosis, they point out, is "an element" in this "science of the art of medicine."[8] Hippocrates already was committed to practice according to principles, *rational* principles, and so is, of course, the modern scientific physician. If today's 'clinical epidemiology' actually does amount to codified and tenable — rational — principles of diagnosis etc., this does not, however, qualify it as a science,[5] to say nothing about its application, or that of whatever actual science, making practice science.[9]

To grasp the genuine essence of medical science, it is good to recall the familiar, simple yet epoch-opening work of Jenner. He inoculated that 8-year-old boy with pus from his sister's cowpox lesion and, some months later, gave him a smallpox inoculation; and behold: the boy did not come down with smallpox! Jenner *documented* this experience for the relevant *scientific community*, for it to judge the significance of the experience beyond those documented facts (particularistic, i.e., spatio-temporarally specific), specifically for it to judge the experience's meaning in the *abstract* (i.e., without a referent in place or time), its role in thus contributing to scientific *knowledge* (about nature, in the abstract). Neither clinical diagnosis nor community-medicine morbidity survey — or health-care description/evaluation (fact-finding, particularistic[10]) for that matter — satisfies this first-order requirement for a piece of work to be one of science.

While those actions, and intentions beyond personally having the documented experience, were essential to making Jenner's work a matter of science, equally essential was the fact that his documentation actually was received and examined by the relevant community of scientists. For, essential to science also is its *co-operative* and *public* character[11] and its recourse to "*evidence as an objective factor* [italics mine] inviting universal examination and compelling ultimate unanimity."[12] Thus qualified, Jenner's work would have been science even if it had failed to advance scientific knowledge (i.e., belief that is intersubjective — shared among experts — by definition[11]); only, in this case it would have been unsuccessful science. Science, thus understood, aims to produce knowledge (abstract), while practice deploys knowledge (in the context of ad hoc facts).

It deserves note and indeed emphasis that in medicine, just as in farming for example, deployed is much abstract knowledge of empirical yet nonscientific origin. It was informal experience in actual practice, not medical science, that gave physicians the knowledge base for, say, the prevention of 'contagion' (Fracastorius, 1546) and the treatment of various injuries — long before the advent of medical science.

While the modern scientific physician is no more committed to rationality than Hippocrates was, fundamentally novel in modern medicine are two implications of the re-

cent advent of medical science. For one, the availability of knowledge from medical science provides, increasingly, a superior substitute for that from informal experience as for the substantive inputs in whatever presumedly rational framework. Reliance on personal experience, while still much touted, is irrational; collective informal experience is preferable but still quite wanting (cf. venesection); and ultimate preference is rationally to be given to evidence from scientific experience — though not in the EBM style of its personal interpretation but in terms of the scientific knowledge (intersubjective) that it has led to. For another, available to the modern scientific physician are many products of medical technology, the development of which has been provided for by progress in medical and other science.

In respect to *rationality* itself, so centrally a required feature of scientific medicine, the learned and suitably modest practitioner of scientific medicine does not equate it with plain common sense — natural logic as distinct from scientific, acquired logic.[13] Moreover, even erudite writings on the concepts and principles — theory — of medicine (s)he reads as instructed by Bacon: "Read not to contradict, nor to believe, but to weigh and consider."[14] When this Baconian habit has become widespread and has led to quite comprehensive and broadly agreed-upon concepts and logically tenable principles, and when the latter are broadly heeded, then and only then has medicine at large become genuinely rational. This has not yet happened, in part because "The dream of reason did not take power into account."[15]

However uniformly committed to scientific practice modern physicians may be, modern practice actually is scientific only to the extent to which its theoretical framework truly is rational and scientific knowledge is deployed in such a framework.

The first article in this series appeared in the Aug. 21, 2001, issue of *CMAJ* (page 441).

Dr. Miettinen is with the Department of Epidemiology and Biostatistics and the Department of Medicine, Faculty of Medicine, McGill University, Montreal, Que., and also with the Department of Medicine, Weill Medical College, Cornell University, New York, NY.

Competing interests: None declared.

References

1. Marti-Ibanez F, editor. *The epic of medicine*. New York: Clarkson N Potter; 1962. p. 66.
2. Starr P. *The social transformation of American medicine. The rise of a sovereign profession and the making of a vast industry*. New York: Basic Books; 1982. p. 59.
3. Russell B. *The scientific outlook*. London: Allen & Unwin; 1931. p. x.
4. Flexner A. *Medical education in the United States and Canada*. Bulletin no. 4. New York: Carnegie Foundation for the Advancement of Teaching; 1910. p. 92.
5. Niiniluoto I. The nature of science. In: Niiniluoto I. *Is science progressive?* Dortrecht (the Netherlands): D Reidel Publishing Company; 1984. p. 1-9.
6. Sackett DL, Richardson WS, Rosenberg W, Haynes RB. *Evidence-based medicine. How to practice and teach EBM*. Edinburgh: Churchill Livingstone; 1998. p. vi.
7. Sackett DL, Haynes RB, Gyatt GH, Tugwell P. *Clinical epidemiology. A basic science for clinical medicine*. 2nd ed. Boston: Little, Brown and Company; 1991. p. ix.
8. Sackett DL, Haynes RB, Gyatt GH, Tugwell P. *Clinical epidemiology. A basic science for clinical medicine*. 2nd ed. Boston: Little, Brown and Company; 1991. p. 93.
9. Niiniluoto I. *Is science progressive?* Dortrecht (the Netherlands): D Reidel Publishing Company; 1984. p. 237-8.
10. Liberati A, Chatziandreou E, Miettinen O. Health care research: what is it about? *Qual Assur Health Care* 1989;1:249-57.
11. Niiniluoto I. *Is science progressive?* Dortrecht (the Netherlands): D Reidel Publishing Company; 1984. p. 4.
12. Buchler J, editor. *Philosophical writings of Peirce*. New York: Dover Publications; 1955. p. x.
13. McCall RJ. *Basic logic*. 2nd ed. New York: Barnes & Noble; 1952. p. xix.
14. Bacon F. Essays, 1597. In: Vickers B, editor. *Francis Bacon. The essays or counsels civil and moral*. New York: Oxford University Press; 1999. p. 134.
15. Starr P. *The social transformation of American medicine. The rise of a sovereign profession and the making of a vast industry*. New York: Basic Books; 1982. p. 3.

Correspondence to: *Dr. Olli S. Miettinen, Department of Epidemiology and Biostatistics, Faculty of Medicine, McGill University, 1020 Pine Ave. West, Montreal QC H3A 1A2; fax 514 398-4503; osm@epid.lan.mcgill.ca*