TÜBİTAK

LEADING ARTICLE

Turk J Med Sci
2007; 37 (4): 191-193

E-mail: medsci@tubitak.gov.tr

The Nature of Medical Evidence and Evidence-Based Practice

John A. MURIE

Tıbbi Kanıt ve Kanıta Dayalı Pratiğin Doğası

Editor-in-Chief,
The British Journal of Surgery

Evidence is what makes people believe in something. We should not forget that medicine has not always followed an evidential path, but in recent times – which we might call the scientific era – evidence has been a dominant force. Today, we recognise that not all evidence is of equal value and this has led to the notion of an evidential hierarchy. This hierarchical tool has many advocates; it has proved useful when considering the strengths and weaknesses of propositions. The best known hierarchical grading system is outlined below:

- Ia Evidence from systematic review or meta-analysis of randomised controlled trials (RCTs)
- Ib Evidence from at least one RCT
- IIa Evidence from at least one well-designed controlled study without randomisation
- IIb Evidence from at least one other type of well-designed quasi-experimental study
- III Evidence from well-designed non-experimental descriptive studies (comparative studies, correlation studies or case studies)
- IV Evidence from expert committee reports or opinions and/or clinical experience of respected authorities.

Another real advance in our assessment of scientific worth has been the development of the formal search strategy in the medical literature. Before the new millennium it was common to find review articles that were based on original articles of indeterminate source. Sometimes the choice of these papers was dictated simply by ease of accessibility. More worrying, the choice at other times was determined by the personal bias of the author conducting the review. Nowadays, the major journals publish only those reviews that are based on an appropriate, unbiased, literature search. Authors are expected to explain the reason for their search technique and their exact methodology. A clear explanation of what papers have been included, what have been excluded, and the reasons why are essential. This is in line with the widely recognised QUOROM (Quality of Reporting of Meta-analyses) Statement1.

It is regrettable that when we consider medical evidence we must never forget human frailty. Researchers are just as prone to the three Is – insanity, incentive and ignorance – as the rest of the population. Fabrication of data may be unusual, but it happens, even at the highest level, and is reported even in the most prestigious journals.

Received: August 05, 2007
Accepted: August 15, 2007

Correspondence
John A. MURIE
Editor-in-Chief,
The British Journal of Surgery

jamurie@hotmail.com

To support such a contention is easy. One need only consider the Woo Suk Hwang affair as recently as last year[2]. This South Korean professor had achieved huge international fame and was lauded widely in his own country. He published his stem cell research in top quality journals, such as Science. However, this all came to a disastrous conclusion on the front pages of the international press when the professor's claim to have used cloning techniques to create stem cell lines of eleven people was proved fraudulent. It is truly difficult to understand how he hoped to get away with this deceit.

While the South Korean example is awesome in scale, such outright data fabrication is probably quite rare. Data mismanagement, its little brother, is not. One well-known study of scientific researcher behaviour has noted that, while only 0.3% of research workers admitted to falsifying data, no less than 15.3% admitted to excluding observations or data points from their analyses based on a 'gut feeling' that they were somehow 'wrong'[3]. To this can be added changing the design, methodology or results of a study in response to pressure from a funding source (15.5%), overlooking others' use of flawed data or questionable interpretation of data (12.5%), failing to present data that contradict one's previous research (6.0%), needlessly republishing the same data (4.7%) and so on. Some of this pathological behaviour can be attributed to the ignorance of a novice researcher on how to conduct a scientific project, but far more often it is due to greed, whether for money or personal prestige. Such misbehaviour has, no doubt, always occurred, but in today's world, medicine is big business and the interface of the commercial requirements of modern drug companies and the ethos of academic research departments is proving increasingly problematic.

It is all too easy to criticise researchers and medical authors while ignoring the other half of the evidence-based equation, namely journals and their editors. To remain healthy, journals must achieve two things. First, they must attract papers and, second, they must attract a readership. Authors choose to send their work to a journal for two main reasons. The first is perceived 'quality' and the second is high impact factor. The impact factor of a journal for a given (index) year is the number of citations made to articles appearing in the journal during the index year, divided by the number of articles published in the journal in the previous two years. Intuitively, editors feel that articles describing 'positive' results are more likely to appeal to readers and to be cited than those expressing 'negative' results (e.g. with no firm conclusion or casting doubt about some approach). Such an attitude is easily recognised by researchers who have, in effect, been trained by editors over time to submit only 'positive' work. The result of this dysfunctional arrangement is that the modern literature is loaded with positive bias – drugs have perfect actions with few side effects and operations produce wonderful results with few complications.

Like the universe's invisible dark matter, this unreported 'dark research' is of crucial importance to our proper understanding of reality. This has, at last, been recognised by the international scientific community and the major journals have jointly developed a plan to address the problem. Most now require all comparative prospective studies to be registered on a freely available website before they commence, if they are to be considered for publication at some future point[4]. This should ensure that there is a clear record, free to all, of all such prospective work, including trials that lead to a 'negative' result. The idea is not, of course, perfect, as future journal content will still have a positive 'spin'. However, serious reviewers will at least have access to a depository of unpublished 'negative' results, and those conducting meta-analyses will be able to seek out authors and obtain 'negative' or unpublished data.

Evidence-based medicine may be defined as 'the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients[5]. The question that immediately suggests itself, of course, is 'How much evidence is there?' Almost certainly there is not as much as we think or would like. For instance, in surgery it has been estimated that only about 24% of activity is based on level Ia or Ib evidence[6]; only 3.4% of all publications in the leading journals are RCTs[7]. This base of evidentially strong work might give some guidance in the clinical sphere but it is not a big base. It is regrettable that many published guidelines, even today, reflect little more than level III or IV evidence.

Yet more hurdles exist. Even when high quality evidence is available, its introduction into routine clinical practice is rarely straightforward. Many doctors are resistant to change while others are besotted by the latest (unproven) techniques. In the senior ranks, personal opinion and hubris go largely unchallenged. Even in those

institutions that welcome the evidence-based philosophy, the dissemination of evidence-based guidelines has often failed to improve clinical practice8. Still, there is hope through systematic reviews, computer-based clinical decision support systems and improved access to relevant information via the internet9. Furthermore, some hospitals have a regular weekly period set aside for discussion and development of evidence-based activity10.

In summary, the effect of medical evidence on clinical practice depends on many factors. First, we must appreciate the hierarchy of evidence. Second, we must appreciate the flaws inherent in current methods of authorship and publication, including the importance of 'dark research'. Finally, we must appreciate that intellectual support for the concept of evidence-based medicine is unlikely, on its own, to see the idea blossom in the clinic, in the ward and in the operating room. To bring evidence-based medicine to the individual patient will require an active, dare one say aggressive, approach.

References

1. The QUORUM Statement. Lancet 1999; 354: 1896-1900.
2. Murphy TJ. On being downstream from faked scientific reports. Br Med J 2006; 332: 674.
3. Martinson BC, Anderson MS, de Vries R. Scientists behaving badly. Nature 2005; 435: 737-738.
4. De Angelis CD, Drazen JM, Frizelle FA, Haug C, Hoey J, Horton R et al. Is this clinical trial fully registered? A statement from the International Committee of Medical Journal Editors. N Engl J Med 2005; 352: 2436-2438.
5. Sackett DL, Rosenberg WMC, Gray JAM, Haynes RB, Richardson WS. Evidence-based medicine: what it is and what it isn't. Br Med J 1996; 312: 71-72.
6. Howes N, Chagla L, Thorpe M, McCulloch P. Surgical practice is evidence-based. Br J Surg 1997; 84: 1220-1223.
7. Wente MN, Seiler CM, Uhl W, Buchler M. Perspectives of evidence-based surgery. Dig Surg 2003; 20: 263-269.
8. Guyatt GH, Meade MO, Jaeschke RZ, Cook DJ, Haynes RB. Practitioners of evidence-based care: not all clinicians need to appraise evidence from scratch but all need some skills. Br Med J 2000; 320: 954-955.
9. Applying evidence to health care delivery. In: Crossing the quality chasm. National Institute of Medicine. Washington, DC: National Academy Press; 2001. pp.145-163.
10. Ubbink DT, Legimate DA. Evidence-based surgery. Br J Surg 2004; 91: 1091-1092.