The Medical Expert in Court: Towards "Evidence-Based Medical Dispute Resolution"

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Abstract: We advocate a systematic approach to evaluating scientific evidence in a particular context, that of law, adjudication and public policy which we call "evidence-based medical dispute resolution". The approach adapts methods of evidence-based medicine and "critical appraisal" that are now well accepted in health care to assist a court or an adjudicating body, as in workers' compensation, to weigh evidence in disputes involving health risks. Health and medical knowledge are essential to the resolution of disputes in law and administrative applications (such as workers' compensation) and provide essential input into public policy decisions. There are no socially agreed-upon rules for the application of this knowledge except the law. Even within the legal system, courts vary and adjudication systems based on tort law do not always work well, even when the interpretation of scientific evidence is agreed upon by all sides. However, a big part of the variability and inconsistency could be removed if there were agreement on the interpretation of scientific evidence. This cannot be done by rigid rules, of course, because the law does not work this way. It has to be done by social convention.

Health and medical knowledge are essential to the resolution of disputes in law (such as tort litigation) and administrative adjudication (such as workers' compensation). The medical or health expert provides essential input into public policy decisions. How to use this knowledge is not always clear. This essay is a brief introduction to this attempt to integrate key elements into a general approach to evaluating scientific evidence for use in law. The argument is elaborated further in our book *Science on the Witness Stand: Evaluating Scientific Evidence in Law, Adjudication, and Policy* (Guidotti, 2001). The approach is still being developed and would benefit from broader discussion, which the objective of this article.

We know how to evaluate evidence in science and we scientists have internalized the "95% certainty" principle for statistical significance inherent in our experiments and studies. This rigorous standard is not unlike the standard of persuasion which is applied in criminal law, which in the British-derived American legal system is "beyond reasonable doubt". However, civil law to resolve disputes between parties (and most systems of adjudication) have a different standard: the balance of probabilities, or "weight of evidence", which translates to >50% certainty. When the medical or health expert ventures into the courtroom, therefore, it is like playing a game with very different rules (Jasanoff, 1995; Meufeld, 1990; Guidotti, 2001).

Some medical expert witnesses stick to the familiar rules of science and are therefore, by definition, too conservativein their opinion. Others may feel liberated by the looser standard of civil litigation and free to make up theories and opinions that are extrapolated far beyond solid evidence. An example of this is suspect testimony in the wave of litigation over "toxic mold" in the United States today. Litigation has been a spawning ground for so-called "junk science" (Guidotti, 2001; Moskowitz, 1998; Crane, 1996), which has threatened the credibility of experts in general and has probably discouraged many knowledgeable investigators and practitioners from sharing their knowledge when it has been needed.

The adversarial structure of the British-derived and some other legal systems encourages extreme interpretation. Because it is the foundation of a trial in that system of law, the adversary system cannot be changed. It would be inimical to the legal system if, for example, plaintiff and defense experts, or claimants and adjudicators, let their experts meet in conference to decide among themselves what science is correct. Something like this, however, has been attempted by judges who set up expert panels to sort through conflicting scientific evidence in order to advise them in class action suits (Price, 1998).

Still, there are standards of practice for ethical practitioners in what I call "witnesscraft" (Guidotti, 2001) just as there is in medical practice. Medical and other professional societies often develop codes of ethics for the deportment and honesty of testimony of their members but these codes are designed to prevent the most egregious breaches and abuses, not to set normative rules (American College of Physicians, 1990).

One wonders if it would be possible to achieve a generally accepted norm, or consensus, on what constitutes good practice in expert testimony. Is there, in other words, a middle ground outside of the courtroom where generally accepted norms for the interpretation of evidence can be discussed and where the responsible expert can form an opinion

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with a level of comfort while meeting the requirements of the legal system?

On a practical level, the legal system lacks the capacity to evaluate the validity of knowledge as evidence and therefore relies heavily on expert opinion. There are no broad, socially agreed-upon rules for the application of medical, public health, and for that matter any scientific knowledge except in the rules of evidence and decisions of the law (Cohen, 2004; Guthell *et al.*, 2003). This is particularly evident in tort litigation, when liability for causing injury is under consideration and often rests on theories of disease etiology and the circumstances surrounding exposure to a hazard.

The application of medical knowledge in tort litigation has had successes and failures:

- Litigation over the legacy of asbestos exposure remains highly controversial: arguments over criteria for recognizing asbestos-related diseases are at the heart of the controversy, despite decades of high-quality research. At the time of this writing, efforts in Congress to set up an adjudication system for these cases are stalled. One particularly controversial issue has been the formulation of fair criteria for accepting claims.
- Litigation over silicone breast implants dried up after it was finally decided that the scientific evidence did not support claims of injury (Goss *et al.*, 2003; Price, 2000).
- Litigation over the safety of mefloquine (an antimalarial drug) has been slow to evolve as scientific evidence accumulates: this is characteristic of a new issue, or "first case".
- Litigation over the safety of Bendectin (an antiemetic used in pregnancy) forced the drug off the market despite its proven efficacy and good safety record (Brent, 2002; Rose, 1991).
- Litigation over "toxic mold" has been contentious and often poorly grounded in evidence.

The common factor in these sets of cases has to do with opinions regarding causation (Muscat, 1989), where the issues are particularly evident. There is, however, a precedent for developing generally accepted standards of expert practice based on a rigorous evaluation of scientific evidence.

A similar problem once existed for the clinical practice of medicine. Over the last 20 years, an approach called critical appraisal has established norms for the acceptance of evidence in clinical practice that are now almost universally accepted. Critical appraisal is a systematic approach to evaluating the evidence based on clinical epidemiology; evidence-based medicine is the practice of medicine justified by valid studies correctly interpreted.

Is it possible to develop a framework for applying the knowledge of health and medicine similar to the concept of critical appraisal? How can the evaluation of medical knowledge be adapted to the rules of the dominant framework of dispute resolution in modern society: the law?

Over the last few years, a small group of scientists and lawyers have engaged in a project to develop a framework for applying the knowledge of health and medicine similar to the concept of critical appraisal but conducted within the dominant framework of dispute resolution in complex and pluralistic societies: the law and its delegated authority to adjudication bodies. We have called the application of medical knowledge in law, adjudication, and public policy: "evidence-based medical dispute resolution" (Guidotti, 2001; 2003; 1998).

Evidence-based medical dispute resolution, conceptually, is a systematic approach to evaluating scientific evidence in a particular context, that of law, adjudication and public policy. The idea behind the approach is to adapt methods of evidence-based medicine and "critical appraisal" that are now well accepted in health care to assist a court (or, as in workers' compensation, an adjudicating body) to weigh evidence in disputes involving health risks. However, there are practical problems: this is not just a matter of treating evidence for court in the same way as one would decide on the best option for treatment.

Thirty years ago, a movement toward evidence-based medicine revolutionized clinical practice. Critical appraisal of the medical literature and the reliance upon evidence-based principles by managed care organizations and utilization review organizations led to the adoption of evidence-based medicine as the dominant mode of clinical practice today. The concept of critical appraisal and evidence-based medicine was not embodied in legislation or enforced as governmental or judicial policy. This movement advanced for many years through education in medical schools, debate, and consensus until it was ready to be institutionalized in practice. It became the accepted norm because it met a need, satisfied a rising demand and made sense to all participants. Evidence-based medicine did not end controversy in medical practice but it confined the scope to the scientific issues and rooted controversy in evidence rather than unsubstantiated opinion (Guidotti, 2001).

The current state of affairs in the courts is not unlike the situation in medicine at the time clinical epidemiology was "invented." The "practice" of medical expert witnesses is not standardized or governed by a consistent set of principles. Each expert witness is essentially autonomous. An expert witness cannot link, at present, to a community of other experts who have a consistent view of how to approach a problem or interpretation. Likewise, medical practitioners thirty years ago were autonomous. That all changed for medical practitioners as a result of increasing external demands for consistency and persuasion.

We suggest that it should be possible to develop a similar framework for the evaluation of scientific evidence in legal settings. It will not be possible – or even desirable - to distill a set of rules or protocols for dealing with scientific evidence in legal settings. However, if the broad outlines of reasonable care can be agreed upon, we will have advanced much further and can concentrate on the factors of the individual case.

Evidence-Based Medical Dispute Resolution

There are no broadly agreed-upon rules for the application of this knowledge except those recognized by the law. Although physicians are subordinate to the requirements of

the legal system when they serve as expert witnesses, the law recognizes professional standards and the norms of medicine and, increasingly, epidemiology. The culture of scientific investigation and the legal privileges given expert witness are reflected in British-derived legal systems, such as US and Canadian law, and in the (US) Federal Rules of Evidence (Article IV).

There is no formula or easy set of rules that can be derived for the universal application of this approach to scientific evidence. Our intent has been to define and promote the process, not to confine or direct it.

We raise the following questions:

- Can a solid consensus be achieved among legal and medical professionals on how disputes related to health and medical management should be "framed" (in legal vocabulary) and the essential health and medical issues defined?
- Can both a medical understanding of complexity and a legal ability to parse the issues each be taught to the other profession, so that there is mutual understanding concerning the essentials?
- Can the tools of critical appraisal (clinical epidemiology, meta-analysis and critical evaluation) be applied to the body of evidence admitted in a legal dispute?
- Can the tools of critical appraisal be adapted to apply to the rules of civil law and administrative practice?

We do not have all the answers nor do we wish to close off discussion by answering them ourselves. These questions could be the agenda for a broad discussion between medical and biomedical and the legal communities in which the discussion may be as valuable as the outcome. To date, we have presented this concept mostly in forums related to occupational health, workers' compensation, and tort litigation.

This framework could be as simple in design, as robust, and as adaptable as the idea of evidence-based medical practice. The rise of evidence-based medicine shows that it is possible for a consensus to emerge, despite the prerogatives of highly independent practitioners. A counterpart in the application of medical knowledge to law may achieve a similar consensus if it meets the need of legal systems, satisfies the demand of society for fairness, and makes sense to all participants.

What would evidence-based medical dispute resolution consist of? A rational approach to evaluating evidence in the health sciences requires both a capacity to generalize, usually on the basis of a population, and a capacity to individualize to the specific case. If the mechanism is known, the explanation enhances the credibility and therefore the persuasiveness of the conclusion. This approach should be useful in the development of a specific case and in guiding the development of the administrative systems in which it is used. Therefore, such an approach should contain these elements (Guidotti, 2001):

- Epidemiology and the interpretation of population data
- Individualization of the evidence to the specific case, using methods of clinical medicine, toxicology and (in the future) genetics
- Statistical treatment that does not necessarily rely on conventional assumptions designed for scientific studies
- An understanding of science that takes into account the social nature of the scientific enterprise, as shown in contemporary studies in the history and philosophy of science
- Adaptability to a variety of applications, including public policy, statutory adjudication systems, and tort litigation

Epidemiology is fundamentally a science of generalizations. The basic approach of epidemiology to estimating risk is to measure the experience of a population of individuals with the expectation that, all other things being equal, the overall risk for the group will be a valid estimate for most members of the group. Epidemiology has become increasingly valued in health-related cases precisely because it is a powerful tool for generalization (Guidotti, 2001; Rose, 1991; Federal Judicial Center, 2000).

However, epidemiology has limitations precisely because it is a science of generalizations. That is its great strength but also its great weakness. When applied to class actions, generalizations make sense because one is considering patterns in a large population. However, most litigation involves individual plaintiffs and the individual circumstances of the case must be separately considered. (This is also true in most adjudication systems, such as workers' compensation.) Thus, epidemiology can inform the expert witness with a description of what happens most of the time or what is most probable, but the interpretation still must be brought to the level of the individual case. This may mean demonstrating that the plaintiff or claimant is similar to a group at demonstrably high risk or that he or she is different and therefore belongs to a subgroup or has unique characteristics and so their risk is not adequately described by summary statistics. This is where a well-prepared, knowledgeable medical expert can play a critical role.

In the assumptions underlying conventional inferential statistics, the risk reflected by the group experience is an estimate for a hypothetical set of similar groups under similar circumstances, not necessarily an accurate prediction for an individual member of the group. It is only the best estimate for a member of that group. This estimate may be misleading if there is considerable variation or heterogeneity in the population. Epidemiologists know this and are generally careful in their testimony to describe patterns in populations rather than conclusions about individuals. In statistical terms, it would also make more sense to apply Bayesian statistics for purposes of evaluating probabilities in an individual case rather than the more conventional ad hoc statistics used in epidemiology.

Another critical issue is how to apply scientific evidence when the standard is "more likely than not" rather than scientific certainty. In other words, what would epidemiology and biomedical sciences be like if the standard for conclusions (not necessarily individual experiments) were 50% rather than 95% certainty? What would be the role of the doctrine of "falsification" (the notion that a theory cannot be proven, only disproven) if the standard for accepting a theory

were only the weight of evidence rather than a single fact that the theory cannot explain? In effect, this is the issue that confronts the expert in developing a theory of what happened in, or "framing", the individual case.

A Key Decision

In the United States, one court decision has clarified the standard for applying scientific information to dispute resolution. The decision in Daubert v. Merrell Dow Pharmaceuticals, Inc. 113 S. Ct. 2786 (1993) attempted to set a new and higher standard for federal courts in reviewing scientific evidence. The effect of this decision was that judges presiding over technically complicated cases have assumed a new "gatekeeping" function monitoring scientific evidence that they cannot be expected to have mastered. This federal court decision was later expanded upon and served as the model for many state decisions (Jasanoff, 1995; Meufeld, 1990; Guidotti, 2001; Kulich *et al.*, 2003). (This was a decision in the Bendectin case, mentioned in the introduction.)

In keeping with an earlier trend in some state high courts and in general trends in adjudication bodies, Daubert requires federal courts to examine the quality and logic of scientific testimony in arriving at their decisions and to apply the standards of science to scientific testimony. Its influence has been felt throughout the legal system, resulting in higher expectations for rigor and persuasiveness in the opinions offered by expert witnesses. A consequence of this case has been that it is also much harder to demonstrate sufficient evidence to support a "first case" when a hazard is new or an association has not previously been recognized (Guidotti, 2001).

The Daubert decision imposed a great burden on courts. Few judges and clerks are prepared to assess scientific data independently and few have staffs equipped to do this knowledgeably. Most lawyers will agree that law school was never designed to prepare them for technical issues in science. Some will even go so far as to say that they went into law to avoid science. In the rare instance in which a judge has had access to a consultant capable of rendering an independent assessment there have been concerns that the in-house expert could unduly affect the decision by manipulating the assessment and by inadvertently supplanting the role of the judge.

Since Daubert, courts have required more documentation of the evidence and have set a higher standard. Peer-review is now the accepted legal standard and experts are often asked on the stand if the evidence they cite and the opinions, or theory of the case, they espouse have been peer reviewed. Theories that are specific to a particular case have no opportunity to be peer reviewed.

The Role of the Medical Expert

Medical testimony used to affirm dispute resolution, is an old and venerable function of health professionals. The law, in general, respects the opinion of physicians and other expert witnesses. However, junk science and the spectacle of dueling experts have provoked a backlash. In past years, the informed judgment of health professionals, without reference to the evidence, carried greater weight than it does today. Since Daubert, courts have put much greater emphasis on defensible arguments based on empirical data and less emphasis on expert judgment. The ability to base testimony on evidence, and to fit the evidence together in an objective-appearing way, is far more important in today's courtroom. Opinion is not enough. So, just how does the expert witness meet these elevated expectations? (Guidotti, 2001; Kulich *et al.*, 2003)

The need to demonstrate a balance of probabilities on the basis of evidence creates two primary responsibilities for the medical advisor in adjudication or the expert witness in court: to provide a clear rationale behind the opinion and to articulate it in a manner that is useful to the adjudicating body. The expert witness has always been expected to express a sound opinion in a comprehensible fashion. However, they are now expected to provide solid grounds and a coherent chain of logic for the opinion expressed and to place it in a context that assists the adjudicator in arriving at an informed decision. The medical expert is expected to reflect either a professional consensus or a well-accepted minority opinion with considerable backing in the scientific community.

A personal or idiosyncratic interpretation of the facts contributes little and may undermine one's credibility. However, in court a reasonable theory developed to fit the particulars of a highly unusual case may appear idiosyncratic, even bizarre. Likewise, an apparently rationale theory of a case may require many contingent steps, each with a low probability, such that the final odds that that is what happened are much less than even (Guidotti, 2001; Hollingsworth *et al.*, 2004).

There is nothing unethical about holding one opinion with respect to the legal interpretation of a set of findings and another with respect to the scientific interpretation. One may legitimately consider a matter to be very likely but not scientifically proven (such as asbestos as a cause of colon cancer). Often, the scientific evidence for an association is strong but not conclusive. In such cases, it is entirely reasonable and responsible for an expert witness to maintain on the witness stand that there is or is not an association, on the basis of an interpretation of "the weight of evidence", but maintain in a scientific forum that the association is not proven because it has not been proven beyond a reasonable doubt. What counts in the end is the weight of what evidence exists, not how strong the body of evidence is in its entirety.

CONCLUSION

It is hoped that in coming years a consensus will emerge among health professionals and lawyers on the most reasonable approach to interpreting scientific evidence in health-related disputes. In law, consensus suggests a normative approach to settling disputes, since strict rules for evaluating scientific evidence are not desirable. In contemporary views of science consensus plays a much different and more flexible role. In science, consensus is an integral part of the scientific method, moving the scientific community forward by agreeing on essential facts and on a working theory. That a working theory may be challenged by falsification (the demonstration of an inconsistent fact) in the next round of research is part of the process of creating the next level of consensus. One may hope for a consensus on the rules of evaluating scientific evidence. Such a consensus should be subject to continual review and inspection, as is science itself, but if

achieved will provide a working framework useful to separate the wheat from the chaff in disputed cases. A broad discussion on these issues is needed between the medical and biomedical and the legal communities.

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