II. Perspective from the editor of *JAMA, The Journal of the American Medical Association*

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Health professionals attempting to keep up with advances in medical knowledge face a formidable task. It has been estimated that more than two million articles are published in the biomedical literature each year. If a physician were to attempt to keep up with this literature by reading two articles each day, at the end of one year, that physician would be more than sixty centuries behind. If physicians were to read everything of possible biomedical relevance, they would need to read about 6,000 articles a day. In 1990, there were more than 100,000 scientific, technologic, medical, and trade periodicals in the world. Garfield has shown that 90% of all major scientific advances are in only 150 of those 100,000 publications. More than 80% of the citations noted by *Science Citation Index* are to fewer than 1,000 journals [1]. So there should be a multidisciplinary core of about 1,000 science and medicine journals worldwide.

I believe that the future of medicine and the future of biomedical communication are inextricably intertwined. Each helps to shape the other and they must be considered together. I believe that the golden age of medicine is at hand for those patients in developed countries (though not necessarily for the doctors) and only for those patients who have enough comprehensive medical insurance. Foremost are advances in science, abundant technology, excellent facilities, enough physicians to take care of all of our people well, adequate funding (though not always allocated in the right ways), a pluralistic system, rapid communications, constructive entrepreneurialism, emphasis on prevention, and, for the first time, the application of scientific management principles [2]. Information is central to this enterprise.

Physicians spend a substantial amount of time keeping up with new advances. This will continue and probably expand as information becomes even more complex, variable, and deep. Stross has found that the average U.S. physician spends 425 hours each year in educational activities. Annually, they read journals a total of 150 hours (3 hours each week), discuss matters with colleagues 100 hours, take 75 hours of formal courses, spend 50 hours reading books, and talk more than 50 hours to pharmaceutical representatives [3]. A 1990 marketing survey of U.S. pathologists also demonstrated that reading journals and textbooks was by far the preferred method for continuing medical education.

I have been working on medical applications of computers since 1963, when I began at Letterman Hospital in San Francisco, and have been distressed by how slowly physicians have applied computers to clinical decision making and to medical information transfer. The use of this technology has lagged far behind the capability of the technology and far behind its availability. No better evidence exists than the recent demise of the most ambitious effort that has occurred in this country to distribute medical information by automated means, namely the project AMA/NET. This loss occurred in spite of a major technologic, informational, and marketing effort by a large organization. The American Medical Association (AMA) had a deep commitment to the principle that AMA/NET was the right thing to do for physicians and patients, and it showed its willingness by investing millions of dollars over several years. AMA finally pulled the plug in 1990, declaring it a failure.

I believe that at the end of this millennium, physicians, medical students, clinical scientists, and allied health workers will continue to receive most of their new medical knowledge from printed material in the form of periodicals. I believe that books, videotapes, cable television, CD-ROM, computerized online databases, formal courses, various continuing medical education programs, and consultation with colleagues will all be valuable methods for medical communication. I believe that the observant physician will continue to receive a great deal of his or her information from experience with patients, the patient being the main teacher for the observant physician. Alternate forms of information transfer will continue to supplement, rather than supplant, traditional methods. If I had to pick one technology from the list that stands the best chance of flourishing in this decade, it would be CD-ROM. Its cost, speed, convenience, and technological clarity (full color, charts, graphs, tables) are so outstanding that it is a promising candidate for mass distribution of medical information. But the marketplace will decide, and I wouldn't bet on it too heavily.

The largest concern I have for the future of biomedical publication and other information flow in-

volves ethics. Ethics is defined as "principles of conduct governing an individual or profession, ideals of character manifested by a people." No one has yet written the definitive book on the ethics of biomedical publication or biomedical communication. The International Committee of Medical Journal Editors, through a series of papers, seems to be writing such a book piece by piece. But the profound threats to our professionalism that we in medicine are experiencing, from business and industry on the one hand and from government regulation on the other, also exist in the field of biomedical information. Cassel has listed ten characteristics of a learned professional:

- self-governance, individually and as a group
- service to the poor, without expectation of compensation
- deliverance of quality
- not ripping people off
- high level of learning
- autonomy of activity
- altruism
- self-sacrifice
- heroism, when needed
- ethical practice with public responsibility [4].

Efforts by those with vested interests to influence decision makers to use their products are ever more creative. Efforts by manufacturers to influence publications so that they will position a product in as favorable light as possible are pervasive and frequently well disguised. So much money is there to be made that ethical principles can be overrun, sometimes in a stampede, to get at the physician and prescriber and especially to influence their leaders. The social contract that has existed between the physician and patient for centuries, in which the physician must be trusted to do the right thing for the patient, is severely threatened at this time. Promoters of products will stop at virtually nothing to get their expensive modern snake oil, whether or not it is effective, marketed successfully. There is major political pressure in Washington at present to remove the question of effectiveness, which the FDA tries to check out in drugs, and only to let safety be checked. Whether or not a drug is effective, it would be marketed, and let the buyer beware. It is up to the editors of respected journals to detect such efforts, and to readers to realize that editorial messages may often be "advertorial" messages. Readers must demand integrity of authors and full disclosure of financial interest in published works [5].

The future of medical journalism is exciting, varied, and treacherous. An editor of a peer-reviewed scientific journal has trust relationships with many segments of the public. These include authors, owners or publishers, readers, institutions, funding agencies, reviewers, editorial boards, advertisers, the media, government, and of course, the public primarily as patients. Not rarely, these trust relationships create conflict. Editors work within their own personal morality, ethics, and values and rely on advice from other editors and segments of their public. Hugh Clegg, a former editor of the *British Medical Journal*, once said, "A medical editor has got to be keeper of the conscience of the profession." He further said, "If he is doing his job right, he will be getting into trouble all the time." I am pleased to report that I am once again in deep trouble in my editing job. It makes me feel really good knowing I'm doing the right thing again, because I continue to be in trouble periodically.

I have conceived the central thesis of today's presentation as the future of ethics in scientific information through a triad of concepts central to quality assessment and control in the clinical/medical or engineering fields. We speak of quality assurance based on structure, process, and outcome. Structure is like anatomy—the rules on how something is set up and organized. Process is how things work—it is like physiology or function. And outcome is the result. In editing, outcome is the content of what you present in print or electronic format and, ultimately, the effects of that content. I believe the editor is the primary source for ethical responsibility among professional publications.

In the area of structure, I propose that we consider objectives and goals, style, and relations between editors and owners or the organization supporting the journals. Journals should have objectives. *JAMA* has ten, the key objective being "to promote the science and art of medicine and the betterment of public health." The International Committee of Medical Journal Editors has issued many key statements on structure, and a set has just been published as a special communication in the May 22, 1991, issue of *JAMA*. In the area of process or function, I propose that we include our ethical responsibilities in peer review, confidentiality, instructions for authors, authorship responsibility, conflict of interest, corrections and retractions, efficiency, and effectiveness.

Editors must be alert to conflicts of interest in authorship, review, acceptance, and rejection of manuscripts. Last year, a Congressional subcommittee assigned to investigate scientific misconduct determined that biomedical journals led the academic community by ensuring proper disclosure of conflicts of interest even though their options to do so are limited. Editors will generally agree that financial conflicts of interest may not necessarily bias the author or invalidate a study but that disclosure to the reader is the appropriate way to deal with such conflict. Since 1985, *JAMA* has required authors to identify in writing any financial interests they have in the subject of manuscripts submitted for publication. That same year, the International Committee of Medical Journal Editors devised guidelines that asked authors to include in-

formation about financial or other conflicts of interest in their submission cover letters. Since October 13, 1989, *JAMA* has required authors of manuscripts accepted for publication to sign a financial disclosure form as a condition of publication [6]. To help authors, this form lists examples of financial interest such as employment, consultant fees, stock ownership, honoraria, and expert testimony fees. While general requirements to disclose conflicts of interest have been routine for many years, such requirements seem new and unfamiliar to many authors. We can only speculate, but it seems that some do not read our instructions for authors. Others do not seem to be able to read at all, since they read the financial disclosure form and it completely blows them away. Some simply forget to inform us of conflicts. If the subject of a published article is contentious, an author's failure to disclose may become very public. This happened with a recent editorial in *JAMA* when an author inadvertently failed to notify us of potential conflict; the alleged conflict was initially reported by a news journalist, a Channel 7 reporter in Boston. What intrigued us was that some of those who submitted letters taking issue with the authors or complaining of views on the disclosed conflict failed to reveal their own obvious conflicts of interest in their letters. Of course, we required this of them before we would publish their letters.

A few reviewers disqualify themselves because, for example, they have a close relationship with the author. Accusations of conflict of interest on the part of reviewers are made on occasion. In 1986, responding to discussions on how to handle such accusations and debate over whether policies on financial disclosures should extend to reviewers, *JAMA* began routinely requesting its reviewers to return manuscripts unreviewed if they perceived any potential conflict of interest. While it is easy to see that an investigator working for a drug company might have a potential conflict if asked to review a paper about a drug produced by the company of a competitor, what about the conflict of a reviewer who is competing with the author for the same grant money? There are a number of more subtle forms of conflict, including becoming privy to new, unpublished information that could enhance recognition, career advancement, increased power, or prestige. In response to discussions in *JAMA*'s editorial board meeting in May 1990, we decided that both reviewers and editorial board members should disclose any relevant conflicts of interest. Editorial board members now are required to sign conflict of interest and financial disclosure statements annually. Reviewers are requested to identify in writing any conflicts of interest with the subject of the manuscript they are reviewing. Under the section entitled "General Comments for the Editor," reviewers sign the following statement, "I disclose below my conflicts of interest in reviewing this manuscript." The form is confidential and seen only by the editorial staff. Authors who disclose financial associations are not precluded from publishing, and reviewers who disclose conflicts are not disqualified as consultants, but we can take that information and weight it in the review process [7].

Finally, the question of whether conflicts of interest may interfere with the publication process must be directed at ourselves, the editors. That is required of *JAMA* and all AMA employees; they are prohibited from engaging in transactions that may pose a conflict of interest with financial activities of the association. They are also prohibited from using or communicating confidential inside information for their own or for another person's benefit. In addition, *JAMA* editors sign a statement agreeing to disqualify themselves from reviewing, editing, or participating in editorial decisions about any manuscript that deals with a matter in which the editor or an immediate family member (spouse or children) has a direct financial interest. These steps are taken because editors are the arbitrators of conflict disclosures and are in the position of the fox guarding the chicken coop if they themselves have financial interest in a particular manuscript. Many medical journals do not have a large staff of editors or the option of disqualifying an editor in handling certain manuscripts. In such situations, it is particularly important that the editors have no financial interest that may affect decisions about a manuscript. We are in the process now of requiring editors to disclose to us, to disqualify themselves if they have financial interest, and to conduct themselves without any such interest [6].

The ethical responsibilities regarding outcome are highly variable, depending on the nature of the subject matter that is handled. In this respect, physics, psychology, biology, and philosophy are vastly different from medicine. The key requirement for all is that the articles should be edited and published in the public interest and not primarily in self-interest. Articles should be dedicated to improving the total human condition. In medicine as an outcome content area, we work primarily in changing knowledge, attitude, and behavior. You may not alter behavior by changing attitude, but certainly, behavior cannot be altered without changing knowledge. Knowledge and behavior are intertwined. In their outcome, ethical medical journals should promote the public health, for example, by working to abolish such barbaric practices as boxing, by getting rid of the tobacco scourge, and by dealing with alcoholism in appropriate ways. We should also attempt to affect public policy in the areas of black American health, Hispanic health, and health of the uninsured. We must consider all humankind as one and think of one medical world.

We publish *JAMA* in 14 international editions in 9 languages and have an aggregate international circulation of 341,000 in addition to the 378,000 circulation of the English-language edition. Ethically, we must distribute information technology; work to prevent war, especially nuclear war; somehow get along in the medical liability area; and prevent physician complicity in state-sponsored human torture—all topics of recent years.

Humans behave on three levels. If personal morality were strong enough, there would be no need for societal ethics or public law, but such is not the case, so we have ethics and law. If ethics were strong enough, there would be no need for public law. I consider the mere existence of a public law to represent a failure of personal morality and societal ethics. Proper medical behavior can only be achieved by organized medicine. Although I agree with Lester King that medical societies are not philanthropic or altruistic organizations but exist to help members gain certain benefits, nevertheless, without organized medicine there would be nothing but chaos or government control, and they are, I guess, about the same thing. Organized medicine in the twenty-first century must be in the public interest and of worldwide scope, ensure access to high quality care with economic soundness, balance health fairly against societal needs, and emphasize good communication and most of all, good will toward all people.

What then do I see in my globe that will happen in the twenty-first century? The human genome will be completely mapped; not only will the genes that determine the amount and texture of the hair on your forearm be understood, but also why you accumulate atheromatous deposits in your popliteal arteries. The potential for genetic manipulation will be realized for better or for worse. Preventive medicine will be the norm and most humans in developed countries will live to their natural lives' end. Even aging will be better understood and challenged and the natural life span extended. The ethical acceptance of death with dignity and without pain, even at a pre-arranged time, will be achieved in our country, most likely in the first decade of the next century. People don't mind spending money on health but they want value for money. Outcome indicators, developed and monitored, will once again enable medicine to deliver value for money.

United countries of North America, including the United States, Canada (except for Quebec), Cuba, and some Caribbean islands, will compete successfully with the united countries of Europe (Western, Central, and Eastern), but unsuccessfully against sovereign Japan, which still won't be united with anyone else. The third world, unfortunately, will continue to be the land of the have-nots. Instant communication via computers, voice and vision phones, and hard copy telephone conduits, will be joined by ever-increasing knowledge of rhetorical terms, voice inflection, and nonverbal communication. Humans will find virtually no privacy of thought or ideas, and governments will lose all capability of controlling or manipulating information against the public. In my opinion, AIDS will still be an endemic problem at the end of the twenty-first century, with no effective vaccine having been developed and successfully implemented worldwide. New, unpredicted, and even unimaginable diseases will arise, and their effects will be, of course, by definition, completely unpredictable. Interplanetary space travel will begin, and space medicine will bring new and interesting challenges, with humans routinely inhabiting other planets.

The classic examples of human frailty will continue unbated, albeit wavering up and down. But many fundamentals will not change. Maslov's big seven that define human behavior will remain. Humans will continue to resist change, and the more things change, the more they will remain the same. The ancient golden rule, "do unto others as you would have them do unto you," will continue to do battle with the modern golden rule, "he who has the gold makes the rules."

Those who heard it can never forget General Douglas MacArthur's farewell address to the corps of cadets at the United States Military Academy at West Point in 1962. As he came near to the close, MacArthur said, "my last conscious thoughts will be of the corps, and of the corps, and of the corps." So must the dedicated physician's every thought be of the patient, and of the patient, and of the patient [8]. That must never change.

Let us remember that the enemies of physicians in 1991 are not the profit-making companies, the congressional or state politicians, the government bureaucrats, the insurance companies, the hospital administrators, certainly not other physicians, not even the attorneys. The enemies of physicians are and will always be premature death, disability, disease, pain, and human suffering [9]. All the other things we hear about are nothing but noise. Dizzy Dean, the famous U.S. baseball pitcher, and later a radio announcer after his playing career ended, used to say, when the bases were loaded and nobody was out, "the ducks is on the pond." I say that the bases are indeed loaded with problems and with resources, and medicine is at bat [10]. All we have to do is manage our collective resources well, and we will be very successful in this century and the next.

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