

Table 5. NONRESEARCH ARTICLE PAGES PUBLISHED IN 1983 AND 1993

| | 1983 | 1993 |
|-------------------------|------|------|
| Case report pages | 440 | 244 |
| Review article pages | 488 | 876 |
| Editorial pages | 249 | 230 |
| Technique article pages | 335 | 213 |
| Total | 1512 | 1563 |

search took place and filled the non-SSO pages of the major surgical journals. In 1993, after the SSO research pages were allocated, 42.0% of the remaining research pages in the major general surgical journals were filled with non-U.S. research, up from 25.5% in 1983.

We made no attempt to assess the quality of surgical research, but the issue of quality cannot be ignored in interpreting the data. More articles are submitted to each of the five journals than can be published. Each journal uses the traditional peer-review process, in which research articles are reviewed by editorial board members and outside reviewers who are experts in the subject of the research. The journal editors, who are distinguished surgical scientists, make the final decision to accept or reject the article for publication. Accordingly, published research articles are those of the highest quality submitted to each journal. Although surgeons tend to present their best work before surgical societies and organizations, the best of which is later published, the finding that the number of SSO pages remained the same between 1983 and 1993 does not indicate that the quality of surgical research remained the same over this decade. However, if the best work is SSO research, then the amount of U.S. quality work remaining after its publication has been seriously challenged by non-U.S. research, which captured an increased percentage of the non-SSO pages during the 1983-to-1993 decade. Whether the quality of SSO research remained the same over the decade we studied is not addressed by our data.

Our study did not address the causes of the decline in U.S. surgical research reported in the five major general surgical journals. As research has become more sophisticated and specialized, investigators may be publishing their work in highly specialized journals rather than in the major general surgical journals. For example, movement of vascular research from the major general surgical journals to specialty journals occurred several decades ago.

Potential reasons for the decline in surgical research can be identified, the most obvious of which is the increasing pressure to generate funds through clinical practice. The extensive time commitment required by patient care leaves less time for the thinking, reading, and

discussions with colleagues so essential for the development of hypotheses and the writing of grant applications. Quality clinical research is inhibited by the necessary institutional review board requirements, informed consent, randomization problems, and access to and supervision of research coordinators. In addition, pharmaceutical firms and medical supply companies are less likely to seek out surgical investigators for research contracts. In some institutions, programs of the Clinical Research Center are not as accessible to surgeons as to other faculty. These problems are shared by many nonsurgical clinical faculty.

The replacement of U.S. research by that performed in Japan and western Europe was also noted by Stossel and Stossel, who analyzed the *New England Journal of Medicine*, the *Journal of Clinical Investigation*, the *Lancet*, and the specialty journal *Blood*. They found a marked increase in the proportion of non-U.S. papers published by these journals, reflecting an increase in high-quality research originating abroad as compared with the United States.¹ This raises issues more global than those confined to the discipline of surgery, but they will affect surgical research in the future. Such issues include the proportion of funds to be allocated for basic as opposed to applied research² and the perceived need to increase funding for patient-oriented research.³ All research will be affected by the declining number of students entering science careers and by the fact that in a given year three of four M.D.s or Ph.D.s will not receive funding from the National Institutes of Health for their research proposals.

Our data show a decline in surgical research. The reasons for this decline must be studied, analyzed, and rectified. This will require the collective wisdom and energy of the leadership in surgery and the support of our surgical organizations. Avoidance of this responsibility may bring harm to our patients and our profession.

References

1. Stossel TP, Stossel SC. Declining American representation in leading clinical-research journals. *N Engl J Med* 1990; 322:739-742.
2. Culliton BJ. Shaping science policy: what's happening to biomedical research in America. *Acad Med* 1991; 66:188-191.
3. Ahrens EH Jr. The lamentable state of basic patient-oriented research: a call for action. *J Int Med* 1994; 235:293-295.

Discussion

DR. JOHN A. WALDHAUSEN (Hershey, Pennsylvania): I think this paper is a very important one and Dr. Nahrwold deserves credit for bringing the subject to our attention.

I briefly reviewed the data from the *Journal of Thoracic and Cardiovascular Surgery*, and you can see a similar trend occurring. Briefly in 1984, 78% of manuscripts came from the United

States and Canada. By 1994, this had dropped to 47%. At the same time, foreign manuscripts rose from 21% to 53%. Perhaps this trend is even more evident since October 1994, when I became editor. The number of papers submitted—not accepted, but submitted—now is one third from the United States and Canada and two thirds from foreign countries.

As to the interpretation of this trend, Dr. Nahrwold feels it is due to a decline in U. S. research activity. Is this truly the case? Or is it more a significant rise in European and Japanese productivity? If the latter, is this not what many of us wanted, science and medical research to become more international?

Perhaps we should be thankful that these foreign manuscripts are published in English in our journals rather than, say, in Mandarin Chinese, the language spoken by more people than any other in the world, and in their journals.

DR. JAMES C. THOMPSON (Galveston, Texas): As I watched John Waldhausen run to the podium, I reflected that he is a living embodiment of the benefits of American research.

I greatly enjoyed this paper. And I have to reflect that every time I am with Dr. Nahrwold I learn from him. There are several aspects of this that are worthy of discussion.

First of all, what is clinical research? Because nearly all research performed by surgeons has a direct impact and implication to patient care, the boundaries between clinical and basic research are blurred.

Atop this slide is a graphic taken from the final report of a study conducted by the Institute of Medicine on research in America. They found that there was a continuum in this research from pure basic study of, for example, the human genome, and then, further over, human immunodeficiency virus expression and human gene transfer, and then getting more clinical, to treatment with biologic modifiers and cancer research protocols, then to research into health services and clinical epidemiology, all the way through to pure clinical reviews and case presentations and the like. Clinical and basic research are in a continuum. A lot of the research that many of us do is blurred along this entire spectrum.

On the bottom left is a study published in the *Archives of Surgery* from Kazutomo Inouye, who was in our laboratory. The bar graphs indicate the increasing number of articles appearing in these five American journals that originated in Japan; the data corroborate what Dr. Nahrwold has told us.

Rather than take a very pessimistic view, I think one alternative explanation is that this reflects the desire of the world community to publish their findings in American journals.

Another important factor that influences this consideration is the data published in basic science journals. I have some anecdotal information on this, shown in the lower right graph, that depicts the distribution of publications from our own laboratory in the target years 1983 and 1993. As investigators develop skills in basic sciences, they become interested in publishing in basic science and in highly specialized journals, and this is illustrated here. In 1983, these were the number of papers published in these five surgical journals and these were in basic journals; 1993, a slight increase, but a great increase in the basic science publications.

I have some young colleagues who are poised on the dilemma of whether to publish in basic science journals and thereby establish their own reputation as scientists and facilitate future

grant reviews at the National Institutes of Health, or whether to establish their own reputation as surgeons. We try to do both, but we end up publishing many of our studies in basic and specialty journals, and this would have been missed in Dr. Nahrwold's study, I believe.

I would like to ask Dr. Nahrwold about this change in clinical papers because we are only talking about a diminution in publication of clinical studies. Fortunately, there has been no diminution in basic studies. You thought a lot about this, David. Why are American surgeons writing fewer clinical papers? Is this simply a reflection of the need for us all to concentrate on monetary matters?

DR. JOHN R. BENFIELD (Sacramento, California): In Sacramento, we have been working in an environment from which the rest of the nation can learn. More than 70% of health care is "managed care," and more than 50% of our University of California at Davis Medical School graduates enter primary care fields.

More than 53% of the budget of our medical school comes from income derived from the practice of medicine. Practice income provides about 14% of basic science department budgets. In short, academic pursuits have depended on cost shifting from practice income that has shrunk and that will continue to shrink per unit of work. We can no longer afford to support academia with such cost shifting, and no source of monies to allow faculty the time to do the thinking and the work required for good publications is on the horizon.

Dr. Nahrwold has called for strategies to reverse the trend that he has identified. I suggest, as one of the strategies, an honest rigorous study of the true cost of time devoted to medical education and research. These data should then be presented to the public and its legislators, who should then assume these costs as a fundamental need of our society.

If we do not develop and implement an effective strategy, our medical research and education will continue to decline and the disturbing trend Dr. Nahrwold has described will continue until we lose the leadership in research and education with which the United States has served the world so well in the past five decades.

DR. SAMUEL A. WELLS, JR. (St. Louis, Missouri): I very much enjoyed reading Dr. Nahrwold's paper, which he sent to me before the meeting. I think perhaps there are some other points to consider which might lead us to a different conclusion.

I looked at five nonsurgical journals where I thought surgeons might choose to publish their basic or clinical research papers. The journals were *Cancer Research*, *Circulation*, *Hepatology*, the *New England Journal of Medicine*, and *Transplantation*. I did not, in this analysis, compare basic science research to clinical science research, rather the total number of manuscripts were considered. Papers published in *Cancer Research* are generally basic science papers, whereas papers published in the *New England Journal of Medicine* are mostly clinical research papers.

Comparing 1983 to 1993, there was a substantial increase in

the number of articles authored by surgeons: more than 70% for *Cancer Research*, more than 27% for *Circulation*, more than 318% for *Hepatology*, and more than 197% in *Transplantation*. The only decrease in the percentage of articles authored by surgeons occurred in the *New England Journal of Medicine*.

An interesting finding was the total number of pages in these journals, not research pages, but the total number of pages that were published in 1983 compared with 1993. There was a less than 1% decrease in *Cancer Research*, but there were substantial increases in the total number of pages published in each of the other journals. Of the five journals mentioned by Dr. Nahrwold, except for one, there was a decrease in the total number of pages published in 1993 compared with 1983. The differences ranged from 14% to 2%.

In parentheses on the slide is shown the number of U. S. scientists compared to non-U. S. scientists. There was a clear trend showing an increased contribution by foreign surgeons compared with those in this country. This was true for every journal. Surgeons in the United States authored 75% of the papers in 1983 and 58% of the papers in 1993. We are becoming a more global community. And for me, this is not a bothersome trend.

A surgical scientist might not choose to publish his or her best research work in a surgical journal. Funding agencies such as the National Institutes of Health and the American Cancer Society might consider a research work of greater importance if it were published in a basic science journal as compared with a clinical journal. This is not only true in the field of surgery.

I would like to ask Dr. Nahrwold if he considered that his sample size may be too small? There are a larger number of surgical journals being published today compared with 10 years ago, and this might in some way account for his results.

DR. H. CLAUDE ORGAN, JR. (Oakland, California): Dr. Nahrwold has caught this editor's hand in the cookie jar. In the April issue of the *Archives of Surgery*, of the seven articles highlighted on the cover, five are from foreign countries. This paper makes some interesting observations.

I agree with Sam Wells that the database and the method of collection might be limited. Of the five journals chosen for review, three are owned by corporate publishers and two by basically educational organizations. Of the five editors, three have been recently appointed. These five journals publish the scientific transactions of 18 surgical organizations, which consume about 36% of their 60 issues annually.

This study and the authors' conclusions may be multifactorial in nature: 1) There have been a proliferation of journals; 2) much of our work is being published in other journals; 3) improved methods of communication; 4) the use of English as a universal language; and 5) the widespread distribution of these five journals, which varies from 8500 copies per month to 21,500. Editors stand in a very difficult position where they are trying to obtain an adequate mix of clinical science and basic research.

I will close by just quoting from a letter a Texas surgeon wrote me after reading one issue of the *Archives* that was heavily laden with biomolecular research: "Organ"—not "Dear Editor," not "Dr. Organ"—"Organ, this issue absolutely has nothing of any value to anyone practicing clinical surgery or treating human beings. If I receive another issue similar to

the last one, you can remove the burden of my name from your list of subscribers. You have succeeded, if it is your intent to produce a publication that will be read somewhere between its passage from the stack of incoming mail to the wastebasket."

Editors have a tough job.

DR. HIRAM C. POLK, JR. (Louisville, Kentucky): I would like to point out the thesis that Dr. Nahrwold approached in this has been a very common source of concern to members of an informal breakfast meeting of the surgical editors which takes place annually at the Clinical Congress. So I think his thesis is correct. I think his data supports observations we have all made.

Let me focus on one little part of his presentation, which has been the forte of this organization for 115 years: clinical research. No matter how you slice the data, the amount of research, clinical research, that merits publication that comes from U. S. authors is going down. And it is one of the most significant downward trends of all of those that Dr. Nahrwold reported.

Part of this is a funding issue and part of this is related exactly to the hypotheses that he discussed. He did not mention the profound lack of support from the NIH for clinical trials, the abusive and really very adversarial relationship of sponsoring pharmaceutical organizations toward clinical research, and the very adverse legal environment in this country for conducting high-quality clinical research that is any way blinded or meaningful.

There are many factors involved in this and the remedies that he proposed will have to be fairly broad reaching if we are going to take on the issue of where clinical research in surgery is published and where it is supported. This is an important paper and it will be food for thought for all of us.

PROFESSOR HENRI BISMUTH (Villejuif, France): As suggested by some previous discussants, it appears that more and more non-American surgeons are sending their research papers to American journals.

The reason is that these journals are more and more international. And the figures reported by Dr. Nahrwold may reflect the increased ability of non-American surgeons to write English and to send papers to American journals.

Indeed, if I was an editor of a non-American surgical journal, I would be really upset by the report of Dr. Nahrwold. Worries cannot be on both sides. It is like French complaining of more Americans in the French restaurants. It does not mean that French taste is losing.

DR. WILLIAM LONGMIRE, JR. (Los Angeles, California): The reasons for this decline are several, as has been pointed out, and we should be pleased that much of the increasingly important surgical research being performed in other countries is being reported in U. S. journals. However, the decrease in reported U. S. research is of concern.

In considering the strategies to reverse this trend as the authors suggest, it should be recalled that a decade ago, the leadership of five of our major surgical organizations, including the American Surgical, sent representatives to form the Conjoint Council on Surgical Research. The alarm was sounded in the first report of the Council, ". . . that investigative activities

were woefully inadequate, research funds were in short supply . . . young investigators were not being trained in sufficient numbers.”

One major objective of the Council was to strengthen an appreciation of the importance of creative activity in academic surgery, to counterbalance the almost overwhelming concerns with clinical practice that was developing in our medical schools. And as the authors have indicated the pressure to produce income from clinical practice has undoubtedly played an important role in the end result reported today.

The American College of Surgeons, one of the original five organizations, took over the functions of the Council approximately 6 years ago in a standing committee, the Surgical Education and Research Committee (SERC). Some progress has been made by these previous efforts. Regular research oriented general sessions have been presented at the annual Clinical Congress of the College; Young Investigator Conferences have been held every other year with the active participation of staff members from the National Institutes of Health; and periodic reports of the committee's activities have been published in the *Bulletin of the American College of Surgeons*. Increasing the general awareness of inadequate financial support of surgical research has encouraged a number of surgical organizations to establish funding for research fellowships. Although things might now be much worse if some action had not been started a decade ago, it is evident from the presentation today that there is still much to be done, and the American Surgical Association and its representatives to the SERC should strongly support and encourage the activities and goals of this committee.

DR. DAVID L. NAHRWOLD (Closing Discussion): I will be as brief as I possibly can. I hope that Dr. Waldhausen and Dr. Bismuth are correct in that the expansion of non-U. S. reports in U. S. journals simply represents the international interest in research. I might point out that we also looked at advertising pages and that there were approximately 2700 pages devoted to

advertising in 1983 and approximately 1000 devoted to advertising in 1993.

Dr. Thompson points out the importance of trying to carefully define what is clinical and what is basic, and our definitions certainly are vulnerable.

There has been another study in which analysis was made of the *New England Journal of Medicine*, the *JCI*, *Lancet*, and the highly regarded specialty journal, *Blood*. The findings are very similar to those that we found in the surgical journals, that the number of articles published from other countries are displacing those published from the United States.

Dr. Benfield pointed out that the cost of research should be quantified. We certainly have not done that very well.

I personally believe that our best surgical investigators have much less time for thought, for developing collaborations and talking to others in basic science and medicine departments who may be helpful in planning research projects and research grant applications.

I do not believe surgeons have the time for the scholarship that developing good grant applications now requires. It is not easy to find an entire afternoon to go to the library to read and to carry out that scholarship.

Pharmaceutical companies do not generally come to surgeons for clinical trials and the rules of our institutional review committees prevent surgeons from doing as well as I think we might.

Dr. Wells pointed out that some of the research that was published in the major general surgical journals is now appearing in the specialty journals that have appeared in surgery. He may well be correct in that assumption. We have no data on that.

It boils down to asking the question, is there a problem or isn't there? And the gross data, albeit imperfect, that we put together shows that there may well be a problem. It seems to me that our next task is to validate this or to refute it. And if we have validated it, then we most certainly must do something about it.