

SCIENTIFIC COMMUNICATIONS¹

History, electronic journals and impact factors

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ABSTRACT. This paper gives a short history of the development of scientific journals. During the last century there has been an increase of 7% a year in the number of scientific journals published, i.e. a doubling of the total number of new journals every 10–15 years. The only way to survive this information flood is to increase the quality of our scientific publications. There is also increasing internationalization among the so-called national scientific journals. The Internet has grown exponentially and now plays a role in the exchange of scientific information. There are many advantages to this, for example, rapid publishing, the cataloguing of articles according to subject, easy access to articles wherever computers are available. There are, however, still many problems to solve, amongst them the archiving of electronic journals and the protection of the integrity of information. The ranking system of measuring the quality of scientific journals using impact factors is of great value, but its importance has been over-exaggerated.

Key words: scientific journals; history; impact factors; electronic journals.

HISTORY AND DEVELOPMENT

The first independent scientific journal, the *Journal de Scavans*, was published in Paris in 1665, followed by the *Philosophical Transactions of the Royal Society in Britain* a few months later (8). However, it was not until the early part of the 19th century that medical journals of high quality were established on a permanent basis. Then came the medical journals devoted to a single speciality.

Derek de Solla Price, Professor of the History of Science at Yale University, USA, has shown that there

has been an increase in the number of scientific journals by 7% a year, doubling the total number of new journals every 10–15 years (16). Solla Price's famous illustration (Fig. 1) shows that between 1665 and the end of this century, about 100,000 new scientific journals have been launched. Fortunately for the readers many of them have ceased to exist. The estimate today suggests that there are some 60,000–70,000 journals, of which about 15,000 are biomedical.

The main reason for this flood of medical articles is not primarily the increasing number of scientists, but rather the science policy in most countries: our physicians, especially those in university hospitals, have

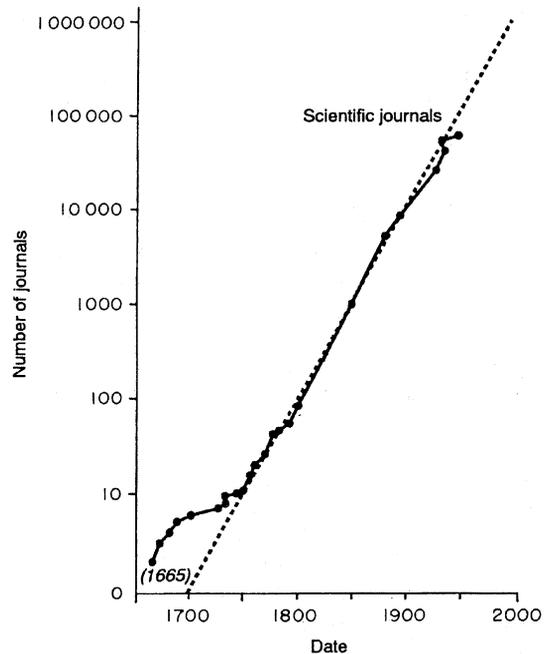


Fig. 1. Number of scientific journals started between 1665 and 1995. From ref. 16.

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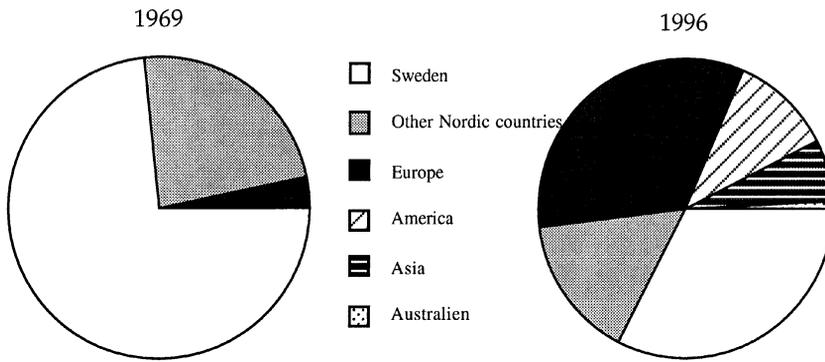


Fig. 2. The geographical development of manuscripts submitted to *Scandinavian Journal of Rehabilitation Medicine* from 1969 to 1996.

to publish or perish. The publications result in scientific credits, which help them to build a successful career. This policy has many disadvantages, but it is difficult to change. However, a better system is needed for the future (3, 10).

In this context there is also increasing internationalization of so-called national scientific journals. Fig. 2 shows the development of manuscripts submitted to the *Scandinavian Journal of Rehabilitation Medicine* from its start in 1969, when about 95% of the manuscripts came from Nordic countries (75% from Sweden) to 1996 (28 years later), when a little over 50% of the manuscripts came from countries other than Nordic ones. The same tendency can be seen in other so-called national journals (15).

Some time ago when I carried out a search on Internet for the number of journals in rehabilitation and physical medicine I received a list of 316 entries. Amongst these I found about 40 journals with what could be called a scientific approach. In this total are an immense number of journals and reports on rehabilitation from federal and local disability organizations.

Is there any hope for us to survive this information flood? The only thing we can do is to *promote quality in our scientific communications* (18). Authors should write and rewrite their papers, and if eventually they find they do not say anything new or essential, they should put them in the wastepaper basket.

In this context, the only way to improve the quality of any journal is to have a panel of experts who are able to give rapid, honest and constructive peer reviews. In addition, every head of a university department has the responsibility of guaranteeing the scientific quality of articles leaving his or her department.

ELECTRONIC NETWORK

The editors of biomedical journals and publishing companies are currently discussing the need for all these printed journals when so many different types of electronic communication are becoming available (5–7). However, we still think that even in the future there will be a need for printed scientific journals of good quality, though with somewhat reduced numbers of each printed edition.

It would be foolish to pretend that journals and editors do not face considerable problems. The economic situation of ever-increasing costs and the difficulty of some libraries to be able to afford subscriptions even to major journals, are always in the background.

I list below the advantages and disadvantages of electronic publishing.

Advantages

1. The electronic medium offers potential intellectual and economic advantages over paper journals.
2. Full-text articles are available at the same time for readers all around the world.
3. After being accepted, an article can become available without delay and be accessed long before the printed version.
4. Many articles can be made available and catalogued according to topic.

Disadvantages

1. If publications move towards electronic journals only, a large part of the world's population, those without

computers, would be excluded from access to this information for purely economic reasons. It would thus lead to discrimination against those in the developing countries.

2. The integrity of the information in electronic journals might be more difficult to protect.
3. The archiving of electronic journals may prove difficult. Journals printed on acid-free paper can be expected to last for several hundred years. Technical advances in the development of the electronic medium have been so rapid that we already face difficulties as electronic data stored 10 or more years ago may no longer be accessible due to the development of different computer systems.
4. Portability: one always needs a computer.

INFORMATION AVAILABLE ON THE DEVELOPMENT OF ELECTRONIC COMMUNICATION

Those who want to be adequately informed about the rapid development of electronic communication are recommended to read the *Directory of electronic journals, newsletters, and academic discussion lists*, the Directory team and ARL staff, Washington DC, Office of Scientific and Academic Publishing, which is published each May in Washington DC. For those with access to the Internet, an especially valuable source is the web site: "Scientific, technical, medical (journals) (peer-reviewed)", address: <http://www.edoc.com/jrl-bin/wilma/spr>. Such sources may help you to find quality publishing in the electronic medium.

IMPACT FACTORS

The so-called "science citation index" provides an objective guide to the impact of any article. It is based on how many times per year an article is quoted in other scientific journals. Citation analysis was developed in the USA by the Institute of Scientific Information (ISI) and impact factors have played an important role in measuring the quality of journals.

Most librarians rely more and more on impact factors in their choice of buying journals. Some journals have a very high impact factor, e.g. the *New England Medical Journal* (24.834) and *The Lancet* (17.948).

Impact factors also depend on the research field; high impact factors are more likely in journals covering large areas of basic research within a rapidly expanding field (14). Small research fields tend to lack journals with high

Table I. *The journals in the rehabilitation medicine field with the highest impact factors in 1996 (From the Institute of Scientific Information)*

Journal	Impact factor
Arch Phys Med Rehab	1.315
Phys Ther	1.136
Support Care Cancer	0.962
Scand J Rehab Med	0.898
Am J Phys Med Rehab	0.865

impact factors. Generally, the impact factors are therefore rather low for journals of rehabilitation medicine. The impact factors for the five scientific rehabilitation journals that ranked the highest during the past years are shown in Table I.

If medical researchers in a small country choose to publish their best articles in journals with as high an impact factor as possible, the result will be that the journals in their own country will be drained of quality. In the long run the "national" journals will lose their economic basis.

The Swedish Medical Research Council has recently studied a series of scientific articles supported by the Council. This study (2) shows the level of impact factors for the journals where the articles have been published (Fig. 3). Articles in *basic medicine* were usually published in journals with higher impact factors than those in *clinical medicine*.

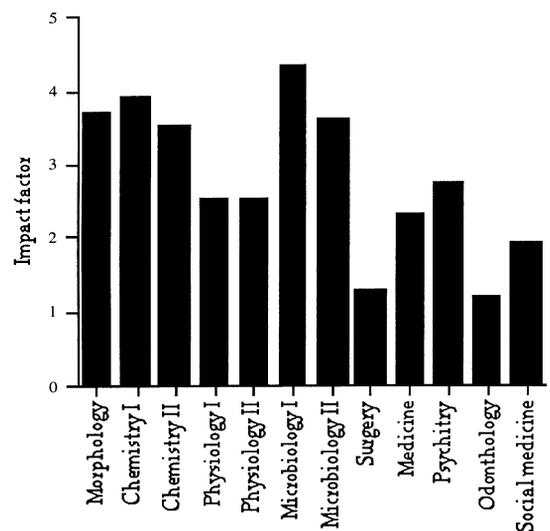


Fig. 3. Mean impact factors in a series of articles supported by the Swedish Medical Research Council (1997).

The Research Council comments that in individual case as well as in small groups it is incorrect to attach too great importance to the impact factor. Important breakthroughs have many times been published in journals with low impact factors and vice versa (even if the first is more common). Both Seglen (14) and Opthof (11) have shown convincingly that the impact factor does not always reflect the quality assessments of an individual paper.

At the European Association of Science Editors' conference in Finland 1997, the Director of the University of Helsinki mentioned that in Finland the impact factor has even been used to calculate the amount of money transferred from the state budget to the university central hospitals for the extra costs of medical training and research. His comment was: "I am sure that the inventor of the impact factor, Eugene Garfield, would find this interesting and perhaps a bit amusing, since he himself has repeatedly warned against oversimplified use of his factor for various purposes" (12).

EXPERIENCE FROM PUBLISHING SCIENTIFIC PAPERS – THE NEED FOR GOOD PLANNING

Due to the rising costs of health and welfare, all medical specialities today experience increased pressure to produce reviews of their treatment methods, with reference to benefits and costs. This of course applies also to rehabilitation medicine.

The cost efficiency of medical methods is often difficult to judge. For an accurate assessment it is necessary to have, in addition to costs, data from clinical studies concerning, e.g. sensitivity in precision of diagnosis, the effects of treatments on survival and quality of life, and the risks and side-effects of treatment methods, apart from all other clinical information of importance for the study. We also need increased resources for follow-up and outcome studies.

Today about 70% of all articles submitted to the *Scandinavian Journal of Rehabilitation Medicine* are rejected. Sometimes we receive large follow-up studies that have taken a long time to carry out but which have an inappropriate structure from the beginning, without a sufficient description of patients, of how the groups were selected and without single- or double-blind groups, and controls. For example, we have received many articles studying low-back pain related to return to work. For these studies it is mandatory to take into account not least the individual's job situation, both when it comes to the job content, how stimulating the job is in itself, etc., and

the physical and psychosocial effects of the job. When these factors have been disregarded, the paper is generally rejected.

Before starting clinical studies in different groups of patients with the aim of studying different types of rehabilitation with reference to results and outcome, it is strongly advisable to collaborate from the start with a professional statistician and with colleagues who have good scientific experience of these types of studies. There are many guidelines available on how to write scientific articles (4, 9, 13, 17).

Finally, I will end this paper with a quote by Bindslev & Sharp Sundt from their paper dealing with the future of our scientific journals (1): "If a journal is to survive it will be necessary for the articles to be of sufficiently high quality that an increased sale of single articles can compensate for the decline in subscriptions to the paper version of the journal".

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