

## Ten years of the journal *Radiology and Oncology* some bibliometric evaluations

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**Background.** Bibliometrics and its methods are a useful set of tools for analysing a scientific journal's relative position in the field. By measuring different quantitative data and comparing them with other journals in the field, certain decisions can be made as to the future of the journal.

**Objectives and methods.** We thought as appropriate to take last ten years of *Radiology and Oncology* (1992-2001) and put that content to double scrutiny: first, by applying various quantitative measurements to the journal's content to get a more objective picture of the whole and of its development in the past ten years; then by additionally comparing it to another international journal from the field and of similar orientation, *Neoplasma*, to illustrate if differences and/or similarities between the two are in favour of or detriment to *Radiology and Oncology*.

**Results and conclusion.** Results show that *Radiology and Oncology* has been progressing in the right direction, but that extra efforts should be made by the editors and the editorial board to attract more articles per issue and to gradually increase the share of experimental articles to boost its impact in the field. Also, to improve its visibility, editors, reviewers and also authors that publish in *Radiology and Oncology* could consider citing the articles published in this journal, in the articles published elsewhere, when appropriate.

*Key words:* radiology; medical oncology; periodicals; bibliometrics

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### Introduction

#### *Rationale*

The aim of the study was to establish, and possibly define, the position of the scientific journal *Radiology and Oncology* and its relative importance in the field, by applying relevant bibliometric measurements.

Bibliometrics has, for various reasons, been widely discussed in scientific circles recently,<sup>1,2</sup> especially two of its best known

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methods, citation analysis and impact factor, a journal's relative weight in scientific community. Both methods are in a way defining the position of a scientific journal in a highly competitive, if not sometimes controversial,<sup>3,4</sup> market of published scientific communication. The nature and importance of citation analysis have not always been given equally welcome reception, since bibliometrics started its life as an independent scientific discipline back in the 60s. However, the results were always met with unhidden interest and due concern.<sup>5</sup> Bibliometric methods - at least some - have been at times widely disputed as well as defended: bias in favour of scientifically important nations or countries and/or English language, overimportance given to the tools provided by ISI<sup>i</sup>, primarily its two important databases, SCI<sup>ii</sup> and JCR<sup>iii</sup>, which exclude most of the journals from non-English speaking world, and journals not published in English language, etc., to name just a few.<sup>6</sup> Still, all bibliometric methods can be used quite safely and effectively, bearing the only reproach which all other quantitative research methods are burdened with, so well epitomized by Disraeli's<sup>iv</sup> referring to the statistics: »There are lies, bigger lies, and statistics!«

By analysing citations, i.e. bibliographic references or sources of information as they are sometimes called which appear at the end of articles, we may evaluate the importance of published articles, and consequently of the journals that publish them, and show their relative weight in peer circles, as well as measure their relevance in the process of exchange of information among scientists.<sup>7</sup> However, when comparing various larger environments, like states or countries and research communications they generate, bibliometric analysis must take into consideration many complex factors affecting such environments, like fair comparison of the scientific development through time, local science policy that does not always have positive impact

on scientific community, the fact that scientific research has increasingly become internationalized, with transborder cooperation involving many different scientists from different cultural backgrounds, etc.<sup>5</sup>

To measure and evaluate the same for Slovene scientific journals is a much more complicated task, since until recently<sup>v</sup> no Slovene research journal had been included in SCI that regularly measures the relevance of selected scientific journals for, and their impact on, the research community worldwide. Citation analysis data on Slovene medical journals, for instance, would serve many purposes, not the least to establish in a more objective way their position and role in the worldwide process of scientific communication exchange.<sup>8</sup> Comparing Slovene medical journals among themselves may be completely impractical, if not downright impossible and would, in any case, require extreme caution to exclude the possibility of contents or disciplines being compared that can not be so. It is therefore necessary to implement a certain level of precaution and to scale down the area of comparison to possibly a very similar, if not the same, specific subject of research or activity.

Since there are not many research centres in Slovenia that would be deeply involved in oncology research, let alone scientific journals that would publish articles in this area, international comparisons are the obvious choice to establish the position of the journal in the field, like *Radiology and Oncology*. Actually, there was an attempt to assign impact factors to the medical journals published in Slovenia, based on recorded articles in the database BIOMEDICINA SLOVENICA.<sup>8</sup> However, this was only an experimental enterprise which brought some interesting and applicable solutions for further consideration.

#### *Genealogy*

The journal *Radiology and Oncology* represents a logical continuation of the now defunct sci-

entific journal *Radiologia Iugoslavica*, that was published by The Yugoslav Association of Radiology and The Yugoslav Association of Nuclear Medicine (later to merge into The Yugoslav Association of Radiology and Nuclear Medicine), appearing for the first time in 1964. Initially, it served the purposes of publishing proceedings or papers from various national meetings and conferences in the field, but soon became more and more a scientific journal with its own set of articles. In the first few years the articles were written and published in various languages of the Yugoslav federation, but later accepted and published articles in all proposed languages. The Association's offices always were at the Institute of Oncology in Ljubljana, and the editorial board mostly comprised Slovene oncologists: S.Plesničar, T.Benulič, J.Škrk, P.Soklič, and B.Tavčar. In the first few years (1964-1968), the journal went through some difficult periods regarding financial support, as well as editorial and organizational matters<sup>vi</sup>, however, after vol.4 (1969), the journal was well established and appeared regularly in one volume per annum, comprising 4 regular issues and irregularly published supplements that in most cases brought proceedings from national and international conferences. This continued until vol.25 (1991) when, on account of the break-up of Yugoslav federation, the communications between members of the Association became very difficult or died out completely and the journal stopped being published. From among the membership a new editorial team grew up, which was more flexible, had new ideas and above all had experience with international journals as all editors regularly published elsewhere. In 1992 and with vol.26, the journal changed the name into *Radiology and Oncology*, the editors were the same as with the last volumes of *Radiologia Iugoslavica*, however the design and looks of the journal were changed, though the numbering of volumes has been kept and basic subject orientation was continued.

The journal today does not resemble in any way its predecessor, except maybe in format which is still a book-size (the upper limit of what in the publishing industry used to be called *octavo*), a feature typical for many journals with a Yugoslav pedigree<sup>vii</sup>. The design and looks are much more appealing, more graphics and photos accompany articles, the paper and print are of better quality (with one or two exceptions, perhaps). The journal is by now an official journal of the Association of Radiology and Oncology, affiliated with Slovenian Medical Association, Croatian Medical Association, Societas Radiologorum Hungarorum and Italian Society of Medical Radiology. The editorial policy is mostly run by T.Benulič, G.Serša (who soon becomes the editor-in-chief), and V.Kovač. Later this group is joined by U.Smrđel. The offices of the journal remain in the Institute of Oncology in Ljubljana, Slovenia. The journal continues as a quarterly, with irregularly published supplements which in many cases are entirely in Slovene language, while the articles in regular issues are now all in English, a clear indication that the journal intends to broaden or extend its authorship and readership populations. The articles are grouped and published in rough subject categories<sup>viii</sup> and each issue also brings reports from meetings, conferences and/or symposia (these are not included into the analysis below), announcements of future conferences, book or new journal reviews (also not included into analysis). The index of each volume (by authors and by subjects) is published in the last issue of the running volume and also includes supplements<sup>ix</sup>, while the names of participating reviewers are given at the beginning of each index listing.

In 1992, an entirely separate publication was published, entitled **Advances in Radiology and Oncology** (editors were G. Serša, T. Benulič, V. Kovač), and though it resembled the then upcoming and still undisclosed new journal *Radiology and Oncology* in

almost all its outer features (paper and print quality, colour and graphic design), it did not have any direct link with the later journal itself, nor was it its supplement. The publication was issued to commemorate the 25<sup>th</sup> volume of *Radiologia Iugoslavica* and brought together, under one title, the papers from some of the best known world experts in oncological radiology, a kind of state-of-the-art at the time. This publication may, however, be to some extent considered as a link between the old journal with the old editorial policy, and the new journal with its new outlook (of which the publication is a precursor) and new and fresh editorial ideas.

### Methodology and types of analyses

Bibliometric analyses of various features of publication were made, using three time probes, i.e. three different years, from the span of 10 years of publishing, i.e. 1992 being the first year under the new title, 1996, and 2001. Only professional articles were considered, while meeting reports, book reviews and letters to the editor were excluded as already mentioned above. Bibliometric methods were applied with the aim to show the professional growth and the quality of articles through time span of ten years and in some cases comparisons were made with *Neoplasma*, an international journal, similar in the subject orientation, that has already been included in ISI's SCI database and is also covered by MEDLINE, the most important biomedical bibliographic database. These are the two goals that *Radiology and Oncology* has yet to achieve, though international comparison might point to the set of very different reasons which may have little to do with contextual or subject quality levels but nevertheless seem to have an important impact on decisions as to who is let in (i.e. MEDLINE) and who remains waiting outside.

### Bibliometric analyses of articles

Two important indicators were measured for both journals: the number of articles per volume in a given period and their diversity expressed by the type of article and article orientation. Since *Neoplasma* does not have the practice of assigning articles to specific subject groupings within the journal while *Radiology and Oncology* does, articles from both journals were therefore grouped under their different types and orientations, based on the classes from the MeSH Thesaurus<sup>x</sup>. This analysis aimed to show the scientific orientation of the articles on one side, and of the journal as a whole on the other.

### Bibliometric analyses of authors

The methods used in this type of analysis were applied to record the changes of and the variety in, the authors' population as one of the basic indicators of importance that the authors give to their publishing in a particular journal and in a particular field; of variety of their nationality or affiliation, and the level of cooperative writing as means of securing publishing of results of research as has recently been claimed in the literature from the field.<sup>9,10</sup>

### Bibliometric analyses of citations

Methodologies used here are among those that general public usually think of when bibliometrics is mentioned and indeed, various types of citation analysis are sometimes taken almost as a synonym for bibliometrics. The aim here is to survey some classical attributes of bibliometric measurements that point to the professional level of articles in one journal and compare them with general trends in similar journals elsewhere (in this case, with the bio-medical journals). This can be deduced by analysing the age of citations, types of literature sources used in citations, the languages in which citations were published, the extent of self citations being practised, etc. Bibliometric theory suggests that this last is

also an indicator of the ambitions present in the editorial policy of the journal to boost the importance of the product and consequently be included into large and important databases and information sources that are valued and frequently consulted by the peers in the profession, which in turn rewards the journal by new citations and consequently higher ratings in the field.<sup>11</sup>

## Results and discussion

### Articles

By analysing data in Table 1 we can see that *Radiology & Oncology* was fairly consistent in the number of articles published per year, i.e. the number is almost always between 40 and 50 ( $r = 48,4$  article/year). There are two exceptional years, 1994 with 62, and 1997 with 83 articles. Both were results of conferences, some articles of which found their way into the journal's regular issues<sup>x1</sup>.

Though *Neoplasma* is a bi-monthly and one would normally expect that it publishes more articles on account of its frequency, the closer look shows that the two additional issues per year can not be the main reason for such a difference but that evidently, every issue of *Neoplasma* brings more articles than *Radiology*

and *Oncology*, an expectation that is confirmed by comparing the total number of articles published in the period 1992-2001 in *Radiology and Oncology* and the total number of articles published by *Neoplasma* only in the three compared years (1992; 1996; 2001): in the three years *Neoplasma* published almost half as much articles as *Radiology and Oncology* in ten years. Also by comparing the figures for the years chosen for analysis in both journals we can see that, for instance, in 1992 *Radiology and Oncology* published just above 10 articles/issue on average, while the same calculation for *Neoplasma* gives us good 11 articles. The difference of 1 article/issue remains steady also in 1996 (11 for *Radiology and Oncology*, 12 for *Neoplasma*), while it increases considerably in 2001 (less than 10 per issue for *Radiology and Oncology*, and over 14 per issue for *Neoplasma*).

Is there a lesson to be learned? Very probably - the figures for *Radiology and Oncology* for the years after the record high 1997 show a consistent decline in the number of published articles per annum which may point to several reasons: weak response by the authors to publish in the journal; the changes in the editorial team, or the change of the editorial policy which might not have been wholeheartedly accepted by potential authors. On the other hand it may also point to the old problem - the authors' population have matured and the same individual researchers who got a chance to publish their research results from their early enterprises in this journal (which, by the way, has always been one of the important missions of the journal), have joined different teams and are now bound to publish together with their new team colleagues in other international journals that expectedly have more impact on the profession, since publishing in high impact publications is favoured by the funding agencies and evaluators.<sup>9,12</sup>

One way of increasing journal's impact might be to increase the number of experi-

**Table 1.** No. of articles per year

Year	<i>Radiol Oncol</i>	<i>Neoplasma</i>
	Articles / year	Articles / year
<b>1992</b>	<b>41</b>	<b>68</b>
1993	43	
1994	62	
1995	46	
<b>1996</b>	<b>44</b>	<b>72</b>
1997	83	
1998	44	
1999	40	
2000	42	
<b>2001</b>	<b>39</b>	<b>86</b>
<i>Total Radiol Oncol</i>	484	
<b>Total (92+96+01)</b>	<b>124</b>	<b>226</b>

mental articles. As Table 2 shows, *Neoplasma* has a significantly higher percentage of such articles than *Radiology and Oncology*. It seems that in the field of oncology, experimental articles tend to receive more citations than other articles, which consequently boosts the impact factor of such journals. Therefore higher crop of original and experimental articles that compete for publishing space, higher quality of selected articles for publication, and consequently a stronger appeal for authors from other parts of the world to publish in the journal. As soon as the journal gets accepted into important international databases, it is significantly more attractive to the authors. It would be therefore advisable for *Radiology and Oncology* to increase the number of articles per issue and/or volume and at the same time to publish more experimental articles.

#### Authors

There is a general trend in STM<sup>xii</sup> category of journals towards expanded authorship, i.e. there are very few articles published in those journals nowadays that would be signed only by one or two authors. On one hand this represents a healthy feature of the medicine as a discipline in itself, i.e. the convergence of scientific disciplines and interconnected teamwork of many researchers from many fields

towards the same goal; on the other, it may hide a much more mundane reason, i.e. being the result of planned response to the conditions put in place by the funding agencies: more researchers share authorship - more credibility the research work has, higher position on the future priority lists for funding.<sup>9,11,12</sup> This may sometimes lead to exaggeration and consequently, hyperauthorship.<sup>10,13</sup>

Still, recent studies show<sup>10,14</sup> that the average number of authors per article for the journals screened by SCI increased from 1,83 in 1995 to 3,9 in 1999 per article<sup>10,12</sup>, while an analysis made for the *British Medical Journal* established that the articles published in that journal in the period 1975-1995 showed increase in the number of authors from 3,2 in 1975 to 4,7 in 1995.<sup>12,13</sup>

As can be seen from Table 3, *Radiology and Oncology* very much experienced similar trends, with only 2,51 authors per article in 1992, increasing to 3,66 in 1996 and reaching almost 4,0 (3,92) in 2001. That such development is the result of the natural development of medicine, as was already explained above, is further witnessed by the results from Table 4: there is no trace of exaggerated authorship as most articles are shared by one, two or at most, seven authors.

**Table 2.** Articles by type and orientation (based on MeSH classes)

Type of article	RADIOL ONCOL			NEOPLASMA		
	1992	1996	2001	1992	1996	2001
- Journal article	85,4%	77,3%	76,9%	98,5%	90,3%	82,6%
- Review	4,9%	9,1%	12,8%	-	5,5%	9,3%
- Editorial	-	-	-	-	-	-
- Letter to the editor	-	-	-	-	-	-
- Case/Clinical trial	9,7%	13,6%	10,3%	1,5%	4,2%	8,1%
- Other*	-	-	-	-	-	-
By orientation	1992	1996	2001	1992	1996	2001
- Diagnostic	53,7%	27,3%	38,5%	27,9%	30,6%	32,6%
- Therapeutic	19,5%	47,7%	41,0%	22,1%	25,0%	29,0%
- Experimental	9,7%	15,9%	15,4%	41,2%	31,9%	25,6%
- Other**	17,1%	9,1%	5,1%	8,8%	12,5%	12,8%

\*reports, interviews, obituaries, patents, abstracts, etc.

\*\*etiological, epidemiological, prevention, incidence analyses, etc.

**Table 3.** Number of authors per year and their average number per article

Year	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	au	art	r	au	art	r
<b>1992</b>	<b>103</b>	41	<b>2,51</b>	<b>293</b>	68	<b>4,31</b>
1993	143	43	3,32			
1994	226	62	3,65			
1995	198	46	4,30			
<b>1996</b>	<b>161</b>	44	<b>3,66</b>	<b>325</b>	72	<b>4,51</b>
1997	342	83	4,12			
1998	173	44	3,93			
1999	167	40	4,18			
2000	133	42	3,17			
<b>2001</b>	<b>153</b>	39	<b>3,92</b>	<b>426</b>	86	<b>4,95</b>
<i>Total R &amp; O</i>	1799	484	3,72			
<b>Total (92+96+01)</b>	<b>417</b>	124	<b>3,36</b>	<b>1044</b>	226	<b>4,62</b>

Hyperauthorship tends to include all kinds of junior staff or technicians which did their work as part of the daily routine and therefore their share can not be equally assigned as authorship<sup>15-16,21</sup>, or past research team members, which used to share their results with the others while still active. This is bogus and throws bad light on published research results of serious teamwork endeavours<sup>xiii</sup>. It is very positive to see that the editors of *Radiology and Oncology* have not yielded to such trends.

Additional important feature to consider is the extent of internationalization of authors that publish in a scientific journal. With a few

exceptions, most journals welcome the chance to have a colourful mixture of authors from all over the world. Still, in this process some institutes and as well as some researchers tend to develop stronger ties with each other, and consequently are more represented in each other's publications. A fair spread of authors from various institutes and countries of affiliation shows a good editorial policy and is also an indicator that regardless of the all-important inclusion into as many international databases as possible, journals which are presently not contained in all of them are still fulfilling their mission and are selected by many authors from various corners of the scientific arena to publish therein. This can certainly be said for *Radiology and Oncology*, as the results in Table 5 not only show a very even spread of international authors, but Table 6 also confirms, that members who are on the editorial team or members of the editorial board do not enjoy any advantages when being peer-reviewed for publishing or that the editors tend to form close circles of authors who have *card blanche* to publish in the journal, whenever and whatever. Only one member of the editorial team was among the top 6 authors with highest number of articles published in 1996, while in 2001, there was none as there were only 2 au-

**Table 4.** Articles by the number of participating authors

	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	1992	1996	2001	1992	1996	2001
1 author	16	5	2	1	3	6
2 authors	10	14	8	15	10	8
3 --	2	5	8	16	10	17
4 --	7	5	9	16	17	9
5 --	4	8	3	8	15	12
6 --	1	2	7	3	8	13
7 --	1	1	0	7	4	8
8 --	0	3	0	2	2	3
9 --	0	0	2	3	0	4
10 or > 10	0	1	0	0	3	0

**Table 5.** Authors by country of their affiliation (at the time of writing)

	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	1992	1996	2001	1992	1996	2001
Australia			1			1
Austria			10	9	5	3
Belarus						1
Belgium				2		
Bosnia and Herzegovina	11					
Brazil				6	4	
Bulgaria			9	1	9	
Canada		9	2		1	
China		5				
Croatia	59	35	35	7	9	12
Czech Republic			6	*97	48	114
Denmark		2				
Finland				2		
France				2		6
Germany	5	34	17	6	4	1
Greece		7	4			
Hungary	2		3	1	6	22
India				55	10	
Israel					2	
Italy				7	4	2
Japan				6	6	
Kuwait					5	1
Macedonia FYRO	4	5				
Poland			8	27	53	63
Romania				8		
Russia		2		7	12	
Slovak Republic					93	124
Slovenia	21	61	43		2	15
Spain				11	3	
Sweden		1		3		
Taiwan					12	20
Turkey					4	14
Ukraine				9		
United Kingdom				4	5	1
United States			15	11	5	1
Yugoslavia**	1			20	19	21

\*The number given contains both, data for Czech Republic and for Slovak Republic

\*\*The name used for FRY or what is now called Serbia and Montenegro

thors that succeeded to publish more than 2 articles in the journal in that year. This also proves that the editorial team does the effort to allow equal representation to all classes of articles, though this may sometimes act against their ambition to be included in high-profiled international medical database, like MEDLINE. Similar features can be seen in *Neoplasma*, though the relative majority of authors from the Slovak or Czech institutes or/and province does hint to, either a slight favouring of domestic authors as compared to *Radiology and Oncology*, or simply to the fact that authors from abroad were less keen to send their articles to be published in the journal in the period reviewed.

#### Citations

There is a very strong opinion, supported by many empirical research, that citations are the very indicators and the key to evaluating the level of scientific significance of one journal. Rennie<sup>16</sup> quotes de Solla Price<sup>18</sup> who proposed that the articles within each scientific discipline could be broadly classified as »scientific« and »non-scientific«, claiming that »scientific« articles are those that have 10 to 20 citations, and »non-scientific« those without citations, while articles with more than 22 citations were to be treated more as further reading assistance.<sup>17</sup> As much as de Solla Price's theories were supported by empirical research<sup>18</sup>, there are actually many motives to be considered when investigating, why authors cite certain works and how many they choose to include into citations.<sup>9</sup>

A look at the results from the Table 7 shows that all articles published in *Radiology and Oncology* fulfill the conditions proposed by the above theory. Actually, absolute numbers showed that some articles did go into excessive citing, but that majority still remain within the relative limits, which may be construed that the journal as such falls into the category of »scientific« in the field. By comparison, *Neoplasma* seems to be overdoing

**Table 6.** Top participating authors in articles (frequency >2)

<i>Radiology &amp; Oncology</i>		
1992 (frq)	1996 (frq)	2001 (frq)
Fučkar, Željko (3)	Bohuslavizki, Karl H. (5)	Bohuslavizki, Karl H. (3)
Ivaniš, Nikola (3)	Brenner, Winfried (5)	Miklavčič, Damijan (3)
Lovasić, Ivan (3)	Clausen, Malte (5)	
Lovrinčević, Antun (3)	Henze, Eberhard (5)	
Perić, Relja (3)	Kovač, Vili* (3)	
Rubinić, Milivoj (3)	Tinnemeyer, Stephan (3)	
	Wolf, Heike (3)	
	Zakotnik, Branko (3)	

\* denotes that the author was on editorial board at the time of writing)

**Table 7.** Number of citations per year and their average number (av) per article

Year	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	cit	art	av	cit	art	av
<b>1992</b>	<b>545</b>	<b>41</b>	<b>13,3</b>	<b>1441</b>	<b>68</b>	<b>21,2</b>
1993	772	43	18,0			
1994	979	62	15,8			
1995	898	46	19,5			
<b>1996</b>	<b>1141</b>	<b>44</b>	<b>25,9</b>	<b>1854</b>	<b>72</b>	<b>25,8</b>
1997	1098	83	13,2			
1998	1083	44	24,6			
1999	719	40	18,0			
2000	827	42	19,7			
<b>2001</b>	<b>671</b>	<b>39</b>	<b>17,2</b>	<b>2702</b>	<b>86</b>	<b>31,4</b>
<i>Total R &amp; O</i>	8733	484	18,0			
<b>Total (92+96+01)</b>	<b>2357</b>	<b>124</b>	<b>19,0</b>	<b>5997</b>	<b>226</b>	<b>26,5</b>

after 1996, when it was still within the values proposed by de Solla Price, while it overflows the limits towards 2001 when it reaches more than 31 citations per article on average.

Besides the number, the age of citations represents another important indicator. It is well known that the aging of the information contained in the articles is directly related to the scientific field from which citations are taken.<sup>5,11,19</sup> Researchers from STM group of journals, with the exception of taxonomy<sup>20</sup>, usually do not profusely cite older sources as it is believed that this would decrease their usability and diminish the importance of the article. Aging is therefore an important factor to consider and scientific disciplines that put 5 years or less as a half-life period<sup>xiv</sup> are fast developing and medicine is one of them.

From the Table 8 it can be seen that the share of fresh research is being more and more prominent among the published articles in *Radiology and Oncology*. If in 1992, citations of up to 5 years of age were almost in equal proportion with those of 5-10 years of age, the proportion of fresh citations grows by roughly 6% every 5 years (36,2% in 1996 and 42,3% in 2001). Similar trend can be traced for *Neoplasma*, though the increase is not so dramatic and shows also a negative trend, as citations in the time frame 5-10 years increase towards 2001, which is quite opposite with *Radiology and Oncology*. The trend therefore is positive for Radiology and Oncology, also by analysing the languages of citations (Table 11), with English overpowering prevalence, especially in the last two test periods, when

Table 8. Citations by age span

Age span	Radiol Oncol			Neoplasma		
	1992	1996	2001	1992	1996	2001
0 - 5	26,6%	36,2%	42,3%	32,7%	41,2%	44,1%
5 - 10	24,8%	30,6%	28,3%	33,9%	29,3%	33,5%
10 - 15	21,5%	17,4%	13,3%	16,3%	12,2%	12,1%
15 - 20	10,8%	8,0%	7,6%	7,9%	7,8%	5,2%
> 20	16,3%	7,8%	8,5%	9,2%	9,5%	5,1%

Table 9. Citations by types of bibliographic sources

Type	Radiol Oncol			Neoplasma		
	1992	1996	2001	1992	1996	2001
Article	75,8%	89,4%	86,7%	90,6%	92,2%	95,5%
Monograph	16,7%	8,7%	11,1%	8,5%	6,3%	4,0%
Congress	3,8%	1,5%	1,6%	0,7%	1,3%	0,3%
Gray lit.*	3,5%	0,2%	0,2%	0,1%	--	0,1%
Other**	0,2%	0,2%	0,4%	0,1%	0,2%	0,1%

\*Gray literature: project reports, internal doctrines, guidelines, expert opinions, reports of consultation meetings, memoirs, sketches of verbatim records, etc.

\*\* Other: mostly electronic sources (excl. articles in e-journals or chapters in e-books), multimedia, graphic material, didactical aids, etc.

citations in authors' local languages dramatically decrease.

Concerning types of bibliographic sources in citations (Table 9), it is quite clear that journal articles represent the principal source of information to the authors of medical articles. That corresponds with the general trend of increased number of journal titles being published in STM group of disciplines and the rapid increase in the number of articles being published annually in scientific journals. Journals are therefore *the* source of choice, while monographs, congress proceedings and gray literature represent only a fraction in overall number of citations. Still, it seems that the authors publishing in *Neoplasma* put even more importance to journal articles as principal information source as their share of over 90% in all three control years is significantly higher than in the same periods for *Radiology and Oncology*. We therefore thought it interesting to see, how high is the level of matching between most cited journals in both publications: as can be seen from the Table 10, only two journals (*Cancer* and *Journal of*

*Clinical Oncology*) are among those that are most frequently chosen as sources for citations by the authors of both journals, while all others do not match. This may point to either different research patterns and specializations of the authors that publish in the two journals, or to a much lower level of similarity of content orientation between the two journals compared. There may be one more reason for such a result: we already mentioned that *Neoplasma* has a higher number of experimental articles, which have a tendency to include higher number of citations, especially those with very high impact factors.

Finally, there remains a question of self-citations. These may appear in two forms: either authors cite their own earlier work in their articles and such citations are not considered as »pure«, or the journal is being cited in the articles it contains. It is that latter form that we decided to look into in our analysis. A normal ambition of every editorial team is to make their scientific journal important among, and achieve recognition in, its own professional circles and be attractive

**Table 10.** Scientific journals most frequently represented in citations in 2001 (with Impact Factors)

<i>Radiol Oncol</i> (2001)	x-cit.	IF	<i>Neoplasma</i> (2001)	x-cit.	IF
Int J Radiat Oncol Biol Phys	33	3.327	Proc Natl Acad Sci USA	247	10,896
Radiology	30	4.759	Cancer Res	113	8,302
AJR Am J Roentgenol	22	1.998	Blood	81	9,273
J Clin Oncol	16	8.530	J Biol Chem	71	7,258
Med Phys	15	2.313	Cancer	61	3,909
Cancer	14	3.909	Br J Cancer	55	3,942
Radiother Oncol	9	2.815	Neoplasma	47	0,637
Eur J Cancer	8	3.460	Mutat Res	44	4,556
Ann Surg	7	6.674	Nature	43	27,955
J Comput Assist Tomogr	7	1.302	J Clin Oncol	40	8,530

**Table 11.** Citations by language

Year	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	1992	1996	2001	1992	1996	2001
Bulgarian	0	0	0	2	0	0
Croatian	56	17	0	0	0	0
Czech	1	0	3	7	11	0
English	399	1072	647	1409	1816	2693
French	20	5	0	0	5	0
German	35	33	13	10	9	9
Italian	1	1	0	0	0	0
Polish	0	0	0	0	3	0
Rumanian	0	0	0	1	0	0
Russian	0	0	0	3	0	0
Slovak	0	0	0	2	5	0
Slovene	33	13	8	0	0	0
Spanish	0	0	0	5	6	0
Swedish	0	0	0	1	0	0

**Table 12.** Self-citations

	<i>Radiol Oncol</i>			<i>Neoplasma</i>		
	1992	1996	2001	1992	1996	2001
NO. OF SELF-CIT.	10	9	7	52	57	40
IN % OF TOTAL	1,8%	0,8%	1,0%	3,6%	3,1%	1,5%

for its peers to publish there. One of the manifestations of such importance is to be accepted into carefully groomed lists of journals that are processed by important international databases (MEDLINE, EMBASE, ISI's range of products, etc.). It will not come as a surprise then, that many editorial teams and reviewers expect from the authors who propose articles for publishing to also cite the appro-

prate articles from the journal they wish to publish in. Such an attitude and policy of the editors should not be considered as being against any moral standards or publishing culture, unless it develops into a condition for the authors, or a »shortcut«, to get accepted for publishing. It should be clear that a certain level of self-citation is always present in every scientific journal.<sup>9</sup>

It is therefore customary in bibliometric analysis of journals to look into this matter as well. Data in Table 12 clearly shows that neither of the two journals have any dramatic developments in that field. Actually, it would be advisable to stimulate the authors a bit more to cite their own published articles in *Radiology and Oncology* in their future works of related subject, regardless where they are accepted for publication. Though such an advice may seem irrelevant at a first glance, it is actually not so, since an independent analysis<sup>12</sup> of the citations in articles that are published in the journals with a high impact factor by some of the authors represented in *Radiology and Oncology* showed, that these authors did not exhibit any bias in citation selection in favour of high impact journals and that the citations in the articles in such journals did not significantly differ from the citations in the articles the same authors got published in *Radiology and Oncology*. Self-citations, as a dubious policy of the editors, are therefore not an issue with *Radiology and Oncology*.

## Conclusions

Results show that Radiology and Oncology is progressing in the right direction, but that extra efforts should be made by the editors and the editorial board to attract more articles per issue and to increase the share of experimental articles to raise its impact. Also, to improve the visibility of the journal, editors, reviewers and also authors that publish in *Radiology and Oncology* could consider citing the articles published in this journal, in the articles published elsewhere, when appropriate. These are two features that stand out from the comparative data for *Radiology and Oncology* and *Neoplasma*. We also noted that there is not such a close similarity between the two journals, though both are from the same field of medicine, both are originating from Central European publishing space, and both have a long tradition (if *Radiologia Iugoslavica* is taken into account as a precursor). So called »scientifically marginal countries«<sup>6</sup> share the same fate of hardship with non-English scientific journals when trying to enter the all-important lists of journals being screened for inclusion into large databases. However, as recent developments show (see note v), the extra efforts invested in tying invisible college network and editorial ambitions can be helpful in achieving such goals.

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### Notes

- i Formerly, Institute of Scientific Information, Philadelphia, now, with the new owners, just plain ISI
- ii Science Citation Index, comprising separate derivatives, SCI - Science Citation Index, SSCI - Social Science Citation Index, and AHCI - Arts and Humanities Citation Index
- iii Journal Citation Report
- iv Benjamin Disraeli (1804-1881), skilful diplomat and British Prime Minister during Queen Victoria's rulership
- v With 2002, *Acta Chimica Slovenica* was included into the list of journals being screened by ISI for SCI and Web of Science
- vi First two volumes were published during 1964-1965, then nothing appeared in 1966; the journal got revived in 1967, then again nothing happened in 1968, until vol.4, when it became settled as a regular quarterly
- vii Due to Yugoslav (JUS) standards for scientific journals that favoured book-size format
- viii Like Computerised Tomography, Diagnostic Radiology, Medical Oncology, Nuclear Medicine, History of... etc.
- ix In the annual index, entries for articles from supplements are given in bold
- x MeSH - **M**edical **S**ubject **H**eadings, the most authoritative and best known co-ordinated and controlled list of subject headings for bio-medical literature; developed and maintained by the National Library of Medicine, Bethesda, USA
- xi Conference proceedings were otherwise published in yearly supplements (usually one or two) following the general policy and practice of medical journals.
- xii **Science, Technology, and Medicine**
- xiii That is why some important medical journals, i.e. *New England Journal of Medicine*, recently started the practice of requesting the authors to actually assign the portion of authorship share for each participating author signed under the article
- xiv Half-life denotes the time after which half or more of published material will not be cited again and is considered to be obsolete.