Sixth International Conference on Webometrics, Informetrics and Scientometrics & Eleventh COLLNET Meeting, October 19 – 22, 2010, University of Mysore,

ALGORITHMIC GENERATION OF SPECIALTY PROFILES FOR MEDICAL JOURNALS

Pudovkin A.I
Institute of Marine Biology, Vladivostok 690041, Russia; e-mail: aipud@mail.ru
E. Garfield
ThomsonReuters Scientific, 1500 Spring Garden Street,
Philadelphia, PA 19130-4067, e-mail: eugene.garfield@thomsonreuters.com

Abstract

A procedure for generating a topical profile of a medical journal is proposed. The procedure consists in calculating of the relatedness index R_{geom} of a target journal with all 50 JCR medical categories and identification of top-related ones. The set of highly related categories (3 or 5) may be regarded as the specialty profile of the target journal. We illustrate the method by considering the content of 7 medical journals, 6 specialized ones and a leading multi-scope journal: *Annals of Surgery*, *Circulation*, *Clinical Infectious diseases*, *European Heart Journal*, *Gut*, *Shock*, and *New England Journal of Medicine*. The data for our analyses are taken from the 2006 and 2009 JCR Science Edition "Related Journals" listings for each medical category. It is shown that the resulting specialty profiles are quite stable in time and well correspond to JCR's assignment of journals to subject categories. JCR's category assignment is a heuristic procedure performed by an expert, while our procedure is comletely algorithmic.

KeyWords: journal topical specification; medical journals; JCR; Journal Relatedness Indexes

Introduction

The problem of classification, that is, specialty characterization of journals is an old and difficult one (Katz and Hicks, 1995; Boyack et al., 2005; Klavans and Boyack, 2006; Leydesdorff, 2006; Zhang et al., 2010a, b). *ISI's Journal Citation Reports (JCR)*, uses a heuristic procedure, which includes subjective consideration of the journal's editorial scope as well as objective measures of its citation relationships to other journals. Recently JCR introduced a new "related journals" feature. The list of related journals are those that are cited

or cite the target journal. Citing and cited relatedness indexes of journals are computed in *JCR* by the method suggested by us earlier (Pudovkin & Garfield , 2002).

In that paper we described relatedness indexes, which could measure cited and citing relationships between journals. We recommended using the largest of these Relatedness Factors, R_{max}, which enables one to algorithmically find topically related journals. In the present paper we develop this theme further by suggesting a modified relatedness index R_{geom}, – the geometric average of citing and cited relatedness index and show how to use them on JCR category data. We illustrate the method by characterizing the content of 7 medical journals, 6 specialized ones and a leading multi-specialty journal: *Annales of Surgery, Circulation, Clinical Infectious Diseases, European Heart Journal, Gut, Shock*, and *New England Journal of Medicine*. The data for our analyses are taken from the JCR (Journal Citation Report, Thomson Reuters Web of Knowledge (http://isiwebofknowledge.com/), 2006 and 2009, from the listing "Related Journals" for each medical category.

Background: Journal Relatedness Measures

In our previous paper (Pudovkin & Garfield, 2002) we suggested the following relatedness indexes:

$$R_{I>J} = C_{I>J}*10^6 / (Pap_J * Ref_I);$$

$$R_{J>I} = C_{J>I}*10^6 / (Pap_I * Ref_J),$$

where $C_{I>J}$ is the number of citations from journal I to journal J ($C_{J>I}$ being the reciprocal citation number), Pap_I, Ref_I and Pap_J, Ref_J are the numbers of papers and references in the year set of issues of the journals I and J.

To characterize the relatedness of a pair of journals we suggested using the largest of these cited and citing relatednesses:

$$R_{max} = \max(R_{I>J}, R_{J>I}).$$

The rationale for using R_{max} is that a journal may not cite another related journal (if the latter is a small or obscure one, or a national or regional journal not cited by international ones, etc.), but is highly cited by it. Being cited is an indication of relatedness. Thus, if journals are sorted by R_{max}, some inconspicuous (but related) journals may be found. Thus, relatedness searches and sorts bring some small, inconspicuous and sometimes not very relevant journals to the top of the listing.

If one wishes, however, to find the most related authoritative and visible journals to a target journal one should take into account the reciprocity of citations: both journals in the

journal pair should cite each other. To better characterize this pattern of intercitation we suggest using the geometric average of the citing and cited relatedness indexes:

$R_{geom} = \sqrt{(R_{I>J} * R_{J>I})}$.

This index turns zero when one of the journals does not cite the other one, and it is smaller than the arithmetic average when one of these indexes is smaller than the other.

Data

JCR lists "Related Journals" in two modes: journals related to a target journal, and journals related to a target JCR subject category. To generate the specialty profile of a journal we use JCR data on relatedness of journals to subject categories. For each subject category JCR lists related journals, which can be sorted by title, $R_{cat>j}$, $R_{j>cat}$, or R_{max}. For our further consideration we retrieved $R_{cat>j}$, $R_{j>cat}$ for the 7 journals with all the 50 JCR categories related to medicine.

The steps for reaching the needed data (relatedness indexes of journals related to a JCR category) are the following:

1. open JCR starting page;
2. mark the item "View a group of journals by 'Subject Category' and click the "Submit" button ";
3. mark the necessary category and click the "Submit" button;
4. click "View summary list" button;
5. click the category (in blue, underscored);
6. click "Related journals" button;
7. resort the listing by journal title.

Results and Discussion

Table 1 lists 10 journals most related to a narrowly specialized journal *Gut*. When the journals are sorted by R_{max} the most related is the journal *j crohns colitis*, a smallish journal with rather low IF (of 1.729). It is poorly cited-related to *Gut* ($R_{Gut>j}$ = 4.60), but strongly citing-related ($R_{j>Gut}$ = 450.36). The 2nd top-related journal is *digest dis*, showing the same relatedness pattern: low cited-relatedness ($R_{Gut>j}$ = 12.37) and high citing-relatedness ($R_{j>Gut}$ = 429.72). Even more pronounced cited-citing asymmetry is seen for the French journal *gastroen clin biol*, which is ranked 9th: 3.49 vs. 285.69. Thus, sorting by R_{max} brings forth

some second-rating journals, which are related to the target journal *Gut*, but rather asymmetrically, being mostly citing-related.

It seems reasonable that the overall relatedness index should take into consideration both the citing and cited indexes. Thus, we suggest a new index, R_{geom}:

$$R_{geom} = \sqrt{(R_{i>j} * R_{j>i})}.$$

When the same journals (related to *Gut*) are sorted by R_{geom} (see the lower part of Table 1) other journals are brought to the top, which are authoritative and high impact ones: *gastroenterology*, *am j gastroenterol*, *nat clin pract gastr*, etc. See a very significant discrepancy in ranks, resulting from the two sorts (columns G and H). Thus, sorting by R_{geom} rather than by R_{max} seems more efficient, bringing to the top more important and relevant journals.

Table 2 lists 10 JCR medical categories most related to the journal *Gut* by Relatedness Factors, R_{max} and R_{geom}. JCR assigns this journal to the "*Gastroenterology & Hepatology*" (*G&H*) *JCR* category. This category ranks first in the list, the *"Nutrition & Dietetics"* category ranks second, the difference in R_{max} values is dramatic, 173.20 vs 15.25. Consider the cited and citing relatedness indexes for the *G&H* category: the cited one is 173.20, while the citing is only 15.25. That is *Gut* is strongly related to the category by being cited by the journals of this category, while it cites journals of the category much less. For the second top category, *"Nutrition & Dietetics"* the both indexes are much smaller, 15.25 and 1.48, which reflects the narrow specialization of the journal.

When JCR categories are sorted by R_{geom} the top category is again *G&H*, R_{geom} being 78.27. The second top-related category is "*Pathology*" with $R_{geom} = 6.55$. Overall, both sorts (by R_{max} and R_{geom}) bring to the top the same categories (9 of the 10 categories are the same), but give them slightly different ranks. The only category missing from the R_{geom} sort is "*Pediatrics*" (9^{th} rank in R_{max} sort vs. 16^{th} rank in R_{geom} sort). The category "*Medicine, Research and Experimental*" is missing in R_{max} sort (the 11^{th} rank vs. 6^{th} in R_{geom} sort).

Thus, we believe, R_{geom} is a preferable relatedness index, which better reflects the topical similarity of journals and JCR medical categories. Hence, we use R_{geom} to generate relatedness profiles for medical journals.

Table 3 lists all 50 JCR medical categories and their relatedness with the 7 medical journals in 2006 and 2009. The last but one line shows the overall sum of the R_{geom} relatedness of the journals with all the 50 medical categories. *New England Journal of Medicine* being a multi-scope journal is related to many categories and has the largest sum of

R_{geom} indexes, 409.2 and 406.8. The journa l *Shock* is a narrowly specialized journal, hence its overall relatedness to medical categories is the smallest, 149.6 and 154.1. To have comparable data for all the 7 journals, we normalized R_{geom} values giving them as percentages of the sum of the indexes over all medical categories. We name these percentages "Relative Relatedness Strength" (RRS). Significantly, the overall pattern of relatedness of the 7 journals to different medical categories is very similar in 2006 and 2009: the coefficient of correlation varies from 0.963 (*New England Journal of Medicine*) to 0.998 (*Shock*), the average being 0.989. Noteworthy, the data of 2006 and 2009 result from non-overlapping analysis time-windows.

It can be seen that the journals are related quite differently with different categories. To better see the difference in relatedness of journals to categories, Table 4 lists the five most related categories for each of the 7 journals. Again, one can see a good agreement between 2006 and 2009 data: for 4 of the 7 journals all the 5 top-related categories are the same, while the 3 top-related categories coincide for all the 7 journals. The top-related categories may be considered the specialty profile of the target journal.

Annals of Surgery is categorized by JCR into a single category, "*Surgery"*. From Table 4 we see that the top related category for this journal is, indeed, "*Surgery"* (RRS in 2006 and 2009: 22.5% and 22.8%), while "*Gastroenterology & Hepatology"* ranks second (16.3% and 13.6%). Thus, this category should be indicated as secondary for this journal.

The journal *Circulation* is most related to "*Cardiac & Cardiovasular Systems"* category (24.4% and 26.9%), then go "*Peripheral Vascular Disease"* (19.0% and 18.5%) and "*Hematology"* (10.7% and 9.8%) categories. JCR categorizes this journal into the same 3 categories, but in different order: "*Cardiac & Cardiovascular Systems"*, "*Hematology"*, and "*Peripheral Vascular Disease"*. We think that the order of categorization produced with our approach is more correct. The same is true for the journal *Clinical Infectious Diseases*. Our order of categorization is the following: "*Infectious Diseases"* (27.2% and 27.9), "*Microbiology"* (10.7% and 10.4%), and "*Immunology"* (7.3% and 7.7%). The JCR categorization is quite different: "*Immunology, Infectious Diseases", "Microbiology"*. Our categorization seems again more valid. The *European Heart Journal* is categorized by JCR in a single category "*Cardiac & Cardiovascular Systems"*. Our routine shows that this journal is indeed most strongly related to this category (38.4% and 36.0%), but it is also strongly related to "*Peripheral Vascular Disease"* category (17.4% and 16.0%), which should be indicated as the second category. The journal *Gut* is very strongly related to "*Gastroenterology & Hepatology"* (50.8% and 47.8%), the next top related category is

"*Pathology"* with RRS much weaker (4.4% and 4.0%). Correspondingly, JCR assigns this journal to a single category, "*Gastroenterology & Hepatology"*. The journal *Shock* is assigned by JCR to 4 categories: "*Critical Care Medicine", " Hematology", " Surgery"*, and "*Peripheral Vascular Disease"*. Our routine gives the same 4 top related categories, but in different order: "*Critical Care Medicine"* (43.2% and 43.0%), "*Peripheral Vascular Disease"* (10.4% and 11.7%), "*Hematology"* (9.1% and 9.8%), and "*Surgery"* (7.4% and 6.3%).

The multi-scope *New England Journal of Medicine* is placed by JCR in a single category: "*Medicine, General & Internal"*. Indeed, this journal is most related to this category, though the RRS is rather low, 9.9% and 8.2%. Compare the RRS values for top related categories of other journals (they range from 22.5% to 55.8%). More even distribution of relatedness values of this multi-specialty journal compared to those of other more specialized journals is clearly seen from the values of coefficints of variation of RRS values (see the bottom of Table 3): it is only 86% and 81% for *New England Journal of Medicine*, while it ranges from 205% to 357% for other 6 journals.

Thus, we conclude that the relatedness indexes allow one to algorithmically generate a precise enough specialty profile of a journal, which largely coincides with JCR categorization as well as with intuitive perception of the journal's content. This specialty profile ramains stable in time. The best relatedness measure for this type of journal characterization is R_{geom}, the geometric average of cited and citing relatedness indexes. Our algorithm consists in the following steps:

1. Extract relatedness indexes ($R_{j>cat}$ and $R_{cat>j}$) from JCR (the listing "Journals Related to Subject Category") for a target journal and all the medical categories.
2. Calculate R_{geom} from the 2 indexes.
3. Sort all the 50 categories by R_{geom} (in descending order).
4. Record 5 top categories, which can be regarded as the specialty profile of the target journal.

In our previous paper (Pudovkin and Garfield, 2002) we suggested using our relatedness indexes for subject categorization of journals using diagnostic macrojournals. In the procedure described in the present paper we used medical categories provided by JCR as the macrojournals. These macrojournals are not the optimal ones, as they often overlap in content (that is the same journals may be included in different JCR categories). Provided that proper diagnostic macrojournals are created for different science fields, our approach may be

used for subject categorization in any field of science or social science. It may also be developed further on for subject categorization of individual papers.

Cited Literature

Boyack K.W., Klavans R. and Borner K. 2005. Mapping the backbone of science. *Scientometrics*, 64(3):351-374.

Katz J.S. and Hicks D. 1995. The Classification of Interdisciplinary Journals: A New Approach . *Proceeding of The Fifth Biennial Conference of The International Society for Scientometrics and Informatics, Rosary College, River Forest, Il, USA,* pp.105-115.

Klavans R. and Boyack K.W. 2006. Identifying a better measure of relatedness for mapping science. *Journal of the American Society for Information Science and Technology*, 57(2):251-263.

Leydesdorff L. 2006. Can scientific journals be classified in terms of aggregated journal-journal citation relatedness using the Journal Citatiojn Report. *Journal of the American Society for Information Science and Technology*, 57(5):601-613.

Pudovkin A.I. and Garfield E. 2002. Algorithmic procedure for finding semantically related journals. *Journal of the American Society for Information Science and Technology***,** 53(13):1113-1119.

Zhang L., Janssens F., Liang L.M., Glanzel W. 2010. Journal cross-citation analysis for validation and improvement of journal-based subject classification in bibliometric research. *Scientometrics*, 82(3):687-706.

Zhang L. , Liu X.H., Janssens F., Liang L.M., Glanzel W. 2010. Subject clustering analysis based on ISI category classification. *Journal of Informetrics*, 4(2):185-193.

Table 1. Ten journals most related (by R_{max} or R_{geom}) to the journal *Gut* in 2009

Column heads: **A:** JCR IF; **B**: number of papers; **C:** R("Gut" to journal); **D:** R(journal to "Gut"); **E:** R_{max}; **F:** R_{geom}; **G:** Rank by R_{max}; **H:** Rank by R_{geom} .

Journal	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Sorted by R_{max}								
j crohns colitis	1.729	43	**4.6**	**450.36**	450.36	**45.52**	1	28
digest dis	1.487	80	**12.37**	**429.72**	429.72	**72.91**	2	14
inflamm bowel dis	4.643	216	**37.56**	**376.75**	376.75	**118.96**	3	5
gut	9.357	180	**354.54**	**354.54**	354.54	**354.54**	4	1
aliment pharm ther	4.357	264	**43.35**	**303.25**	303.25	**114.66**	5	6
neurogastroent motil	3.568	168	**22.97**	**302.74**	302.74	**83.39**	6	11
digestion	1.770	76	**24.74**	**299.76**	299.76	**86.12**	7	10
scand j gastroentero	2.084	188	**40.52**	**286.56**	286.56	**107.76**	8	7
gastroen clin biol	0.928	170	**3.49**	**285.69**	285.69	**31.58**	9	35
am j gastroenterol	6.012	312	**87.84**	**284.02**	284.02	**157.95**	10	3
Sorted by R_{geom}								
gut	9.357	180	**354.54**	**354.54**	354.54	**354.54**	4	1
gastroenterology	12.899	405	**210.59**	**144.033**	210.59	**174.16**	19	2
am j gastroenterol	6.012	312	**87.84**	**284.02**	284.02	**157.95**	10	3
nat clin pract gastr	4.520	12	**148.41**	**148.96**	148.96	**148.68**	30	4
inflamm bowel dis	4.643	216	**37.56**	**376.75**	376.75	**118.96**	3	5
aliment pharm ther	4.357	264	**43.35**	**303.25**	303.25	**114.66**	5	6
scand j gastroentero	2.084	188	**40.52**	**286.56**	286.56	**107.76**	8	7
clin gastroenterol	5.642	179	**45.88**	**226.83**	226.83	**102.01**	17	8
gastroenterol clin n	2.558	44	**33.73**	**278.41**	278.41	**96.91**	12	9
digestion	1.770	76	**24.74**	**299.76**	299.76	**86.12**	7	10

Table 2. Ten JCR medical categories, most related to the journal *Gut* by R_{max} or R_{geom} in 2009

Collumn Heads: A: R(category to *Gut*); B: R(*Gut* to category); C: R_{max}; D: R_{geom}; E: Rank by R_{max}; F: Rank by R_{geom} .

JCR medical categories	**A**	**B**	**C**	**D**	**E**	**F**
Sorted by R_{max}						
Gastroenterology & Hepatology	173.2	35.37	173.20	78.27	1	1
Nutrition & Dietetics	15.25	1.48	15.25	4.75	2	8
Pathology	14.68	2.92	14.68	6.55	3	2
Surgery	14.65	1.6	14.65	4.84	4	7
Medical Laboratory Technology	12.02	1.28	12.02	3.92	5	10
Medicine, General & Internal	11.41	3.33	11.41	6.16	6	4
Immunology	8.85	4.42	8.85	6.25	7	3
Oncology	8.66	3.34	8.66	5.38	8	5
Pediatrics	8.28	0.56	8.28	2.15	9	16
Transplantation	8.24	2.61	8.24	4.64	10	9
Sorted by R_{geom}						
Gastroenterology & Hepatology	173.2	35.37	173.20	78.27	1	1
Pathology	14.68	2.92	14.68	6.55	3	2
Immunology	8.85	4.42	8.85	6.25	7	3
Medicine, General & Internal	11.41	3.33	11.41	6.16	6	4
Oncology	8.66	3.34	8.66	5.38	8	5
Medicine, Research and Experimental	8.03	3.43	8.03	5.25	11	6
Surgery	14.65	1.6	14.65	4.84	4	7
Nutrition & Dietetics	15.25	1.48	15.25	4.75	2	8
Transplantation	8.24	2.61	8.24	4.64	10	9
Medical Laboratory Technology	12.02	1.28	12.02	3.92	5	10

Table 3. Category relatedness profile of seven medical journals: *Annals of Surgery* (AS), *Circulation* (Cir), *Clinical Infection Diseases* (CID), *European Heart Journal* (EHJ), *Gut, New Englad Journal of Medicine* (NEJN), and *Shock* in 2006 and 2009

Numbers in the table are the values of the Relative Relatedness Strength (%) of the journals to the categories

	JCR category	AS		Cir		CID		EHJ		Gut		NEJM		Shock	
		2006	**2009**	2006	**2009**	2006	**2009**	2006	**2009**	2006	**2009**	2006	**2009**	2006	**2009**
1	Allergy	0.0	**0.0**	0.1	**0.1**	0.7	**0.3**	0.0	**0.1**	1.5	**1.7**	2.3	**2.6**	0.1	**0.0**
2	Andrology	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**	0.0	**0.9**	0.0	**0.0**
3	Anesthesiology	2.2	**2.6**	1.6	**2.2**	0.3	**0.2**	1.0	**2.0**	0.7	**0.8**	1.7	**1.5**	2.8	**3.0**
4	Cardiac & Cardiovascular Systems	1.8	**1.9**	24.4	**26.9**	0.5	**0.5**	38.4	**36.0**	0.3	**0.3**	5.2	**5.3**	1.7	**1.6**
5	Chemistry, medicinal	0.0	**0.0**	0.2	**0.2**	0.2	**0.1**	0.0	**0.0**	0.2	**0.3**	0.1	**0.1**	0.2	**0.2**
6	Clinical Neurology	0.3	**0.3**	0.7	**0.7**	0.4	**0.3**	0.5	**0.4**	0.5	**0.6**	1.9	**1.5**	0.2	**0.3**
7	Critical Care Medicine	6.9	**9.1**	3.8	**2.4**	3.6	**3.8**	0.0	**2.0**	1.1	**0.9**	4.5	**5.0**	43.2	**43.0**
8	Dentistry, Oral Surgery & Medicine	0.0	**0.0**	0.1	**0.1**	0.3	**0.2**	0.0	**0.1**	0.1	**0.0**	0.4	**0.1**	0.0	**0.0**
9	Dermatology	0.9	**0.9**	0.1	**0.1**	1.7	**1.2**	0.0	**0.0**	0.4	**0.6**	1.7	**1.9**	0.7	**0.6**
10	Emergency Medicine	2.1	**3.8**	6.8	**2.8**	0.8	**0.8**	2.2	**1.8**	0.2	**0.0**	2.7	**1.9**	4.0	**4.2**
11	Endocrinology & Metabolism	1.0	**1.4**	1.7	**2.1**	0.2	**0.1**	1.3	**1.4**	1.3	**1.3**	2.4	**2.1**	0.6	**0.8**
12	Gastroenterology & Hepatology	16.3	**13.6**	0.1	**0.2**	2.1	**1.6**	0.1	**0.1**	50.8	**47.8**	2.8	**3.2**	2.0	**1.9**
13	Geriatrics & Gerontology	0.2	**0.7**	0.7	**1.1**	0.7	**1.0**	0.4	**1.2**	0.2	**0.2**	1.4	**1.3**	0.2	**0.3**
14	Healthcare Sciences & Services	0.8	**1.6**	0.5	**0.9**	0.4	**0.5**	0.6	**0.8**	0.3	**0.0**	2.7	**2.3**	0.0	**0.0**
15	Hematology	1.1	**1.4**	10.7	**9.8**	1.4	**1.7**	9.4	**8.6**	1.0	**1.4**	4.8	**5.0**	9.1	**9.8**
16	Immunology	1.5	**1.0**	0.5	**0.7**	7.3	**7.7**	0.3	**0.4**	2.8	**3.8**	2.2	**2.7**	2.8	**2.5**
17	Infectious Diseases	0.6	**0.6**	0.3	**0.3**	27.2	**27.9**	0.2	**0.5**	1.7	**2.0**	4.4	**3.7**	1.5	**0.8**
18	Integrative & Complementary Medicine	0.0	**0.0**	0.0	**0.0**	0.2	**0.0**	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**
19	Medical Ethics	0.0	**0.0**	0.0	**0.0**	0.0	**0.2**	0.0	**0.0**	0.0	**0.0**	2.0	**2.3**	0.0	**0.0**
20	Medical Informatics	0.7	**0.9**	0.9	**1.2**	0.4	**0.5**	1.8	**1.6**	0.3	**0.4**	1.5	**1.2**	0.0	**0.0**
21	Medical Laboratory Technology	1.2	**1.1**	1.9	**2.1**	1.4	**0.8**	2.5	**3.0**	2.0	**2.4**	1.6	**1.7**	1.3	**0.8**
22	Medicine, General &	4.1	**3.8**	5.6	**5.7**	6.3	**4.8**	9.1	**7.4**	4.3	**3.8**	9.9	**8.2**	0.7	**1.0**

	Internal														
23	Medicine, Legal	0.0	**0.0**	0.2	**0.0**	0.1	**0.0**	0.0	**0.0**	0.0	**0.0**	0.3	**0.7**	0.0	**0.0**
24	Medicine, Research and Experimental	1.5	**1.3**	2.4	**2.3**	1.3	**1.3**	1.6	**1.6**	2.7	**3.2**	1.9	**2.1**	1.8	**1.9**
25	Microbiology	0.2	**0.2**	0.1	**0.1**	10.7	**10.4**	0.1	**0.2**	1.1	**1.0**	1.4	**1.3**	0.5	**0.4**
26	Neurosciences	0.1	**0.1**	0.2	**0.2**	0.1	**0.1**	0.1	**0.1**	0.4	**0.7**	0.6	**0.4**	0.3	**0.4**
27	Nursing	0.0	**0.3**	0.5	**0.5**	0.2	**0.2**	0.3	**0.2**	0.0	**0.0**	0.2	**0.2**	0.0	**0.0**
28	Nutrition & Dietetics	1.6	**1.5**	1.3	**1.4**	0.3	**0.3**	0.6	**0.8**	3.0	**2.9**	0.9	**1.2**	0.5	**0.5**
29	Obstetrics & Gynecology	0.9	**1.2**	0.4	**0.4**	0.5	**0.4**	0.4	**0.4**	0.3	**0.2**	2.5	**2.6**	0.1	**0.1**
30	Oncology	5.2	**5.5**	0.2	**0.2**	0.5	**0.5**	0.0	**0.1**	2.7	**3.3**	2.7	**2.7**	0.1	**0.2**
31	Ophtalmology	0.0	**0.0**	0.1	**0.0**	0.4	**0.2**	0.0	**0.0**	0.0	**0.1**	0.3	**0.9**	0.0	**0.1**
32	Orthopedics	0.3	**0.9**	0.1	**0.0**	0.3	**0.2**	0.0	**0.0**	0.0	**0.0**	0.8	**0.8**	0.2	**0.4**
33	Otorhinolaryngology	0.6	**1.2**	0.0	**0.0**	0.6	**0.4**	0.0	**0.0**	0.3	**0.0**	0.5	**0.7**	0.0	**0.0**
34	Parasitology	0.0	**0.0**	0.0	**0.1**	1.3	**1.8**	0.0	**0.0**	0.0	**0.2**	0.3	**0.5**	0.0	**0.0**
35	Pathology	2.5	**2.3**	0.9	**1.0**	0.9	**0.6**	0.6	**0.5**	4.4	**4.0**	1.5	**1.7**	0.9	**0.7**
36	Pediatrics	1.9	**1.1**	0.8	**1.1**	3.0	**2.5**	0.3	**0.4**	1.2	**1.3**	2.4	**2.2**	0.4	**0.3**
37	Peripheral Vascular Disease	3.2	**3.4**	19.0	**18.5**	0.4	**0.3**	17.4	**16.0**	0.6	**0.5**	4.5	**4.6**	10.4	**11.7**
38	Psychiatry	0.1	**0.0**	0.2	**0.2**	0.2	**0.1**	0.4	**0.2**	0.3	**0.2**	1.3	**0.7**	0.0	**0.0**
39	Public, Environmental & Occupational Health	0.5	**0.6**	1.1	**1.2**	2.3	**2.5**	1.3	**1.1**	1.0	**0.8**	1.9	**1.7**	0.1	**0.0**
40	Radiology, Nuclear Medicine & Medical Imaging	3.3	**1.9**	1.4	**1.5**	0.2	**0.1**	1.5	**2.0**	1.3	**1.1**	0.9	**1.1**	0.0	**0.1**
41	Rehabilitation	0.0	**0.2**	0.2	**0.1**	0.2	**0.1**	0.0	**0.0**	0.0	**0.0**	0.8	**0.4**	1.2	**0.1**
42	Respiratory System	2.6	**2.5**	4.4	**5.1**	3.3	**3.8**	4.0	**4.4**	0.6	**0.6**	3.7	**4.2**	2.2	**2.5**
43	Rheumatology	0.1	**0.0**	0.8	**1.0**	0.8	**0.7**	0.3	**0.8**	1.3	**1.4**	2.8	**2.5**	0.3	**0.3**
44	Substance Abuse	0.5	**0.0**	0.3	**0.2**	0.4	**0.6**	0.0	**0.2**	1.4	**1.3**	1.1	**0.6**	0.8	**0.6**
45	Surgery	22.5	**22.8**	1.6	**1.7**	0.7	**0.8**	1.0	**1.1**	3.6	**3.0**	1.5	**1.8**	7.4	**6.3**
46	Toxicology	0.1	**0.1**	0.3	**0.4**	0.5	**0.4**	0.3	**0.3**	0.6	**0.7**	0.5	**0.5**	0.4	**0.3**
47	Transplantation	9.6	**6.7**	1.5	**1.7**	2.4	**4.5**	1.0	**1.3**	1.9	**2.8**	2.6	**3.3**	0.9	**1.3**

48	Tropical Medicine	0.0	**0.0**	0.1	**0.2**	6.5	**6.6**	0.0	**0.0**	0.0	**0.0**	2.1	**1.4**	0.0	**0.0**
49	Urology & Nephrology	1.0	**1.4**	1.2	**1.3**	0.7	**0.6**	1.0	**1.0**	0.3	**0.5**	1.8	**2.9**	0.5	**1.0**
50	Virology	0.0	**0.0**	0.2	**0.2**	5.2	**5.7**	0.0	**0.0**	1.2	**1.9**	1.9	**1.7**	0.1	**0.2**
Coefficient of variation, %		295	**196**	227	**234**	212	**217**	302	**280**	357	**336**	86	**81**	317	**318**
Sum of 50 R_{geom} values		172.6	**159.5**	251.8	**272.6**	181.6	**188.6**	121.2	**147.6**	166.0	**163.9**	409.2	**406.8**	149.6	**154.1**
Correlation between 2006 and 2009 values		0.982		0.987		0.995		0.997		0.999		0.963		0.998	

Table 4. Most related medical JCR categories for seven medical journals, in 2006 and 2009

Column Heads: A: Rank of the journal by RRS (within the JCR medical category) in 2006, B: the same in 2009, C: JCR category, journal, D: RRS, %, 2006, E: the same, 2009. * sorting took into consideration more than 1 decimal digit.

A	**B**	**C**	**D**	**E**
		2006 2006&2009 2009	**2006**	**2009**
		New England Journal of Medicine		
1	1	*"Medicine, General & Internal"*	**9.9**	**8.2**
2	2	"*Cardiac & Cardiovascular Systems"*	**5.2**	**5.3**
3	3	"*Hematology"*	**4.8**	**5.0***
4	4	"*Critical Care Medicine"*	**4.5***	**5.0***
5	5	"*Peripheral Vasular DiseaseЭ*	**4.5***	**4.6**
		Annals of Surgery		
1	1	*"Surgery"*	**22.5**	**22.8**
2	2	"*Gastroenterology & Hepatology"*	**16.3**	**13.6**
3	3	"*Transplantation"*	**9.6**	**6.7**
4	4	"*Critical Care Medicine"*	**6.9**	**9.1**
5	5	"*Oncology"*	**5.2**	**5.5**
		Circulation		
1	1	"*Cardiac & Cardiovascular Systems"*	**24.4**	**26.9**
2	2	"*Peripheral Vascular Disease"*	**19.0**	**18.5**
3	3	"*Hematology"*	**10.7**	**9.8**
4	>5	"*Emergency Medicine"*	**6.8**	2.8*
5	4	"*Medicine, General & Internal"*	**5.6**	**5.7**

>5	5	*"Respiratory System"*	4.4	**5.1**
		Clinical Infectious Diseases		
1	1	*"Infectious Diseases"*	**27.2**	**27.9**
2	2	*"Microbiology"*	**10.7**	**10.4**
3	3	*"Immunology"*	**7.3**	**7.7**
4	4	*"Tropical Medicine"*	**6.5**	**6.6**
5	>5	*"Medicine, General & Internal"*	**6.3**	4.8*
>5	5	*"Virology"*	5.2	**5.7**
		European Heart Journal		
1	1	*"Cardiac & Cardiovascular Systems"*	**38.4**	**36.0**
2	2	*"Peripheral Vascular Disease"*	**17.4**	**16.0**
3	3	*"Hematology"*	**9.4**	**8.6**
4	4	*"Medicine, General & Internal"*	**9.1**	**7.4**
5	5	*"Respiratory System"*	**4.0**	**4.4**
		Gut		
1	1	*"Gastroenterology & Hepatology"*	**50.8**	**47.8**
2	2	*"Pathology"*	**4.4**	**4.0**
3	3	*"Medicine, General & Internal"*	**4.3**	**3.8**
4	>5	*"Surgery"*	**3.6**	3.0
5	>5	*"Nutrition & Dietetics"*	**3.0**	2.9
>5	4	*"Immunology"*	2.8	**3.8**
>5	5	*"Oncology"*	2.7	**3.3**
		Shock		
1	1	*"Critical Care Medicine"*	**43.2**	**43.0**
2	2	*"Peripheral Vascular Disease"*	**10.4**	**11.7**
3	3	*"Hematology"*	**9.1**	**9.8**
4	4	*"Surgery"*	**7.4**	**6.3**
5	5	*"Emergency Medicine"*	**4.0**	**4.2**