Original article

Assessment of departmental research activities and overall productivity by using the impact factor of scientific publications

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This research studied on research articles published in international scholarly journals by the staffs of the Faculty of Medicine, Chiang Mai University during the year of 2010-2012 in context of impact factor. The study found that impact factor scores are ranged between 0-3.0. Articles published by departments of Pre-Clinical in journals with high impact factor scored >3.0 were mostly from the department of Microbiology and Physiology at about 41.7% and 35.2%. In the mean time, Articles with high impact factor scored >3.0 published by clinic-departments were from the department of Internal Medicine, Pediatrics and Community Medicine at about 44.1%, 30.5% and 31.6%. When consider articles with high impact factor among the department that the researchers are affiliated, found that more than half of those research are draw from research projects coo-perated between the faculty' staffs and international institutions.

In terms of research investment, the faculty has supported budget for a published paper around 104,000-242,000 baht. In the same way, in 2010-2012, the faculty has granted scholar on papers published in impact factors journals around 41,400-74,000 baht per a unit of impact factor score. In conclusion, to worth the budget, the faculty should considering seeking for collaboration from international institutions. By seeking for research collaboration with international institutions, the faculty would have some specialists or mentors who can work as mentors and share their expertise in specific research field with the faculty' staffs. Consequently, such collaboration would initiate continuing research publications in journal with high impact factors and faculty's recognition.
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Keywords: research incentives, impact factor

Background and objective

A strategy for assessing departmental research productivity at the Faculty of Medicine, Chiang Mai University, is used to examine the effect of incentives on faculty authors of scientific papers. The object of these incentives is to increase research publications in peer-reviewed indexed

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journals. Each year, a document for performance appraisal[1] is prepared by the faculty, highlighting research performance indicators, as follows:

1. Number of research papers and research innovations
2. Amount of extramural grants, and
3. Number of patents, petty patents and intellectual properties.

In order to assess the quality of papers published in peer-reviewed journals, the journal impact factor score was considered. The ratio of impact factor scores to research budget from the faculty also was evaluated. Results of this study are for use in future research, which is related to strategic planning.

The Faculty of Medicine, Chiang Mai University, gives support to research activities as follows: research funding, a research equipment center, animal laboratory center, research ethics institution review board, manuscript editing service and grants for publication that are available to all staff.

The impact factor score can be used as a measure of research quality and also facilitate a high level of quality assurance. Examples of its use are for making informed decisions concerning appointments for research positions, reviewing funding proposals, rewarding scientists, and assessing doctoral thesis quality and quality assurance.

Calculation of an impact factor is based upon the average number of citations received per paper published in a particular journal during the previous two years. The list of journals with the impact factor is indexed in the SCImago Journal & Country Rank (SJR)–Science edition, which was devised by the Institute for Scientific Information (ISI). Impact factors are calculated annually from approximately 5,000 scholarly journals. Journal rankings are made available in the Journal Citation Reports, which are used to reference the impact factor for many institutions.

In scientific research fields, various experts have criticized the use of the impact factor as being a substitute measure for the quality of individual papers. These researchers argued that the impact factor of journals should not be used for evaluating scientific merit, since the number of citations can be manipulated technically by publishers in order to boost their ranking[2]. Additionally, there also is general debate on the point that journal databases have an English language bias. A further issue is the summation of review articles, which could give misleading results, since they are cited more heavily than original ones[3]. Another criticism in calculating the impact factor is the timeframe, in which citations are counted inconsistently. Also, some research areas are able to collect and disseminate knowledge more rapidly than others, therefore, the two-year period of counting citations may be too short in some fields[4]. Similarly, journals that focus on common diseases such as cancer and cardiovascular disease have a broader readership than those centered on rare diseases, and this may skew impact factor analyses further.

In addition, other factors such as the citable period, citation behavior, variation in journal databases and keywords are not taken into account when measuring the impact factor[5]. Hence, in order to evaluate quality of research, the scope and implications of a specific research field, and recognition of the scientist, should be included together with impact factor based assessments.

The faculty expects the researchers to submit their manuscripts to journals in a peer review system with a high impact factor. To reward an article accepted for publication in high impact factor journals, the faculty introduced an incentive program on 19th October, 2010[6], which was updated on 12th February, 2013[7].

To determine how successful this incentive program has been, the quality of research articles was analyzed systematically by calculating impact factor scores for manuscripts published between 2010 and 2012, as found in PubMed, Web of Science and SCOPUS databases.

Objectives of this study

1. To gather and analyze relationships between the scientific quality of journal articles

and the impact factor of those originating from the Faculty of Medicine, Chiang Mai University, and published between 2010 and 2012.

2. To investigate the ratio of the faculty's annual research budget to total number of impact factor journals.

Research design

Study design: Cross-sectional descriptive study

Data analysis: Impact factor presented by descriptive statistics, average, mean, max, percentage and table.

Collection of data and methods

The impact factor score was collected between 2010 and 2012 from all articles published from the faculty in journals with an impact factor indexed in Web of Science, SCOPUS and PubMed databases. Information of the research budget was collected from the annual report of the Research Administration Section, Faculty of Medicine, Chiang Mai University. Both the impact factor score and research budget were analyzed in order to estimate the ratio between the two.

Variables

1. Impact factor of journal for articles published by faculty staff.

2. Department of the first author or correspondent.

3. Amount of annual budget and allocation for research activities.

Definition

1. Impact factor is a bibliometric parameter based on the average number of citations received per paper published in a particular journal during the previous two years.

2. Number of articles from teaching staff published in journals indexed in SCOPUS, Web of Science and PubMed databases.

3. Number of teaching staff is in the personnel database.

4. The amount of budget for research activities is money available from the annual government budget allocation and faculty income for fulfilling the faculty's research strategy such as funding proposals, laboratory equipment and other research activities.

5. Number of staff with papers published in international scholarly journals refers to individual members of teaching staff who authored published articles, regardless of how frequently. This was measured by the one-time count method.

Proposed outcome

1. To have recognition of the overall impact factor score of journals in which faculty staff had their papers published.

2. To have recognition of research work quality, as carried out by faculty staff in context of the impact factor.

3. To have recognition of the ratio of the faculty's annual research budget to number of impact factor journals. This is beneficial for the strategic planning of research development.

Results

It was found from the Web of Science, SCOPUS and Pubmed databases that between 2010 and 2012, the Faculty of Medicine, Chiang Mai University, contributed articles to 193, 216 and 179 journals, respectively, with the total number of articles being 302, 326 and 276, respectively.

Observations from the table include:

• The top 3 clinical-departments that produced the most papers were initially Internal Medicine, Obstetrics and Gynecology, and Surgery.

• However, later in 2012, the Department of Pediatrics increased its number of publications, and thus replaced the Department of Surgery in third place.

• The top 3 pre-clinical departments that produced the most publications were initially Biochemistry, Microbiology and Parasitology.

• However, later in 2012, the Department of Physiology increased its number of publications significantly and moved to the top of the table.

Applying statistics to problems

The impact factor scores of journals in which all faculty articles were published between 2010 and 2012 were analyzed, and descriptive statis-

Table 1. Publications from the Faculty of Medicine, Chiang Mai University, between 2010 and 2012

	Year 2010 Number (%)	Year 2011 Number (%)	Year 2012 Number (%)
Anatomy	11 (3.6)	9 (2.8)	9 (3.3)
Pediatrics	26 (8.6)	14 (4.3)	19 (6.9)
Ophthalmology	5 (1.7)	6 (1.8)	16 (5.8)
Psychiatry	11 (3.6)	15 (4.6)	17 (6.2)
Microbiology	20 (6.6)	21 (6.4)	19 (6.9)
Biochemistry	29 (9.6)	23 (7.1)	20 (7.2)
Forensic Medicine	5 (1.7)	5 (1.5)	2 (0.7)
Parasitology	18 (6.0)	19 (5.8)	17 (6.2)
Pathology	11 (3.6)	14 (4.3)	8 (2.9)
Radiology	8 (2.6)	16 (4.9)	11 (4.0)
Anesthesiology	5 (1.7)	5 (1.5)	2 (0.7)
Surgery	27 (8.9)	23 (7.1)	10 (3.6)
Physiology	11 (3.6)	18 (5.5)	25 (9.1)
Obstetrics and Gynecology	35 (11.6)	44 (13.5)	32 (11.6)
Orthopedics	11 (3.6)	7 (2.1)	10 (3.6)
Internal Medicine	36 (11.9)	52 (16.0)	32 (11.6)
Pharmacology	11 (3.6)	7 (2.1)	5 (1.8)
Family Medicine	2 (0.7)	3 (0.9)	5 (1.8)
Community Medicine	5 (1.7)	19 (5.8)	13 (4.7)
Rehabilitation Medicine	10 (3.3)	3 (0.9)	-
Otolaryngology	5 (1.7)	3 (0.9)	3 (1.1)
Total	302	326	276

tics were presented by each department.

The primary data showed that impact factor scores ranged from 0 to 3.0, but some of the ranges varied. When grouping the articles published in journals with an impact factor score >3.0; 26.4%, 29.1% and 17.0% were found in 2010, 2011 and 2012, respectively.

Data from 7 pre-clinical departments showed that the Department of Biochemistry had the highest publication rate between 2010 and 2012, followed by the Department of Microbiology and Parasitology. However, in 2012 the number of papers published from the Department of Physiology increased rapidly, resulting in a change of order in the highest publication rate, as follows: (1) Department of Physiology, (2) Department of Biochemistry, and (3) Department of Microbiology. The articles published in high impact factor journals (≥3.0) were produced by the Department of Microbiology (41.7%) and Physiology (35.2%). Publications from the Department of Parasitology were published in journals with an impact factor score of between 2.001 and 3.000. On the other hand, other departments published their articles in journals with an impact factor score of between 1.001 and 2.000.

The data from 14 clinical-departments indicated that from 2010 to 2011, the departments with the highest publication rate were as follows: Internal Medicine, Obstetrics and Gynecology and Surgery, consecutively. The articles published during this time in higher impact factor scored journals (≥3.0) were produced by the Department of Internal Medicine (44.1%), Department of Pediatrics (30.5%) and Department of Community Medicine (31.6%). Other clinical departments published their articles in journals with impact factor scores of between 1.001 and 2.000.

A summary of the publications from each department is shown in Table 2 and 3.

When focusing on the number of institutes

Table 2. Impact factor score of journals in which articles were published from pre-clinical departments between 2010 and 2012

Department	Year 2010	Year 2011	Year 2012	3-year overall
Anatomy	1.001-2.000	1.001-2.000	1.001-2.000	1.001-2.000
Microbiology	>3.000	>3.000	2.001-3.000 and >3.000	>3.000
Biochemistry	1.001-2.000	>3.000	1.001-2.000 2.001-3.000	1.001-2.000
Parasitology	0	2.001-3.000	2.001-3.000	2.001-3.000
Pathology	0	1.001-2.000	>3.000	1.001-2.000
Pharmacology	>3.000	>3.000	1.001-2.000	1.001-2.000
Physiology	1.001-2000	>3.000	2.001-3.000	>3.000

Table 3. Impact factor score of journals in which articles were published from clinical departments between 2010 and 2012

Department	Year 2010	Year 2011	Year 2012	3-year overall
Pediatrics	>3.000	1.001-2.000 and >3.000	0	>3.000
Ophthalmology	1.001-2.001	>3.000	1.001-2.000	1.001-2.000
Psychiatry	0	0	0 and 1.001-2.000	0
Forensic	0 and 0.001-1.000	0	0.001-1.000	0.001-1.000
Radiology	1.001-2.000	0.001-1.000	1.001-2.000	1.001-2.000
Anesthesia	0	0	0 and 1.001-2.000	0
Family Medicine	0 and 2.001-3.000	0	2.001-3.000 and >3.000	0
Community Medicine	Equally in every group	0 and >3.000	>3.000	>3.000
Rehabilitation Medicine	1.001-2.000	2.001-3.000	No publication	1.001-2.000
Surgery	0	1.001-2.000	0	0
Obstetrics and Gynecology	1.001-2.000	0.001-1.000 and 1.001-2.000	1.001-2.000	1.001-2.000
Otolaryngology	0	0 and 0.001-1.000 and 1.001-2.000	0.001-2.000 and 1.001-2.000	0
Internal Medicine	>3.000	>3.000	>3.000	>3.000
Orthopedics	>3.000	>3.000	1.001-2.000	>3.000

represented in the list of authors, who published articles in journals with a high impact factor score between 2010 and 2012, results showed that most of the papers were submitted through global collaboration between Thai staff and international researchers. It can be concluded that the collaboration between faculty staff and international researchers had an impact on developing research, building an extensive research network and enhancing the faculty's reputation.

Ratio of research budget and publications

In order to increase the number of publications in international impact factor journals, the Faculty of Medicine, Chiang Mai University, has been providing a larger budget for research activities. There has been increased funding for research, research equipment, animal laboratory facilities, inception of an ethical research review board, manuscript proof reading and publication fees since 2008. Budget information on research activities, number of publications and summary of impact factor is shown in Table 4.

Table 4 shows that the research funds allocated by the Faculty of Medicine have been increasing annually. However, while the number of pub-

Table 4. Budget for research activities, number of published articles and summation of impact factor

Type	Year 2010	Year 2011	Year 2012
Annual budget for research activities (baht)	31,324,830.27	78,907,904.25	30,215,673.47
Number of articles published in indexed journals	302	326	276
Summation of Impact Factor	756.74	1065.7	571.855
Research budget/number of published articles	103,724.60	242,048.79	109,477.08
Research budget/summation of impact factor	41,394.44	74,043.26	52,838.00

lications increased dramatically from 2010 to 2011; it decreased from 326 to 276 in 2012, but with similar impact factor scores to those before.

From 2010 to 2012, the Faculty of Medicine supported publications by providing research funding as follows:

- 103,724.60 baht (2010)
- 242,048.79 baht (2011), and
- 109,477.08 baht (2012).

In addition, the faculty gave financial awards to faculty staff who published their papers in high impact factor journals. Financial awards of 41,394.44, 74,043.26 and 52,838.00 baht per unit of impact factor score were given in 2010, 2011 and 2012, respectively. It can be seen that the faculty provided twice the total money for research in 2011 as that available in 2010. Thus, it can be assumed that more publications and greater impact factors generated increased funds.

Discussion

This study showed that research articles produced by faculty staff had been published in peer-review journals, with an impact factor score of mostly between 0 and 3.0. However, some papers were published in journals with an impact factor score higher than 3. When considering researchers who had their articles published in journals with a high impact factor score , it was found that more than half of them were involved in research cooperation between faculty staff and international institutions, for example, being a co-investigator or at a study site of multicenter trials.

The Faculty of Medicine has encouraged its staff to publish their research articles in international journals since 2006 by financing publication fees and introducing personal financial awards, which are given according to two criteria, i.e.(1) type of publication, e.g. original article or case report, and (2) success in publishing an article in a journal with high impact factor score. These awards and other forms of financial support are the main strategy for encouraging staff to publish their work in international journals. Consequently, Key Performance Indicator (KPI) scores were increased to meet the goal of the faculty's Quality Assurance (QA).

Recently, many journals started releasing online versions of their publications (e–journals)[8], which facilitate the user with specific articles of interest that can act as references. Furthermore, many journals have been made available as open- access journals, with increasing numbers of citations. Although the publication fee for e-journals is expensive, researchers are eager to use this service. It is widely believed that open-access journals will become even more popular, and their impact factor score will increase[9]. Publishing research results in open-access journals benefits the readers, as they can access any raw data presented on the website. Open access can minimize the possibilities of scientific fraud and eliminate bias in accepting an article for publication, for example, negative findings can tend to be dismissed in other forms of publication. Using open access benefits the research and the entire research community.

Articles in basic medical science journals are cited more than those in clinical medical journals, resulting in an increased impact factor score[10-12]. The number of citations in clinical

medical journals, depends on the readership, for example, Internal medicine or Surgery journals tend to have a higher number of citations than Ophthalmology journals. This is because Internal medicine has a larger professional community. Also, some researchers would rather submit their articles to journals that are well recognized or those that have reviewers with the power to launch new policies at the national level[13]. Therefore, journals with a high impact factor score are not always the target of all researchers when publishing their work.

The research community suggested that good scientific research quality would enable it to develop. The impact factor should only be a minor component for indicating the quality of a particu-lar research, as each piece of work has its own merit.

For this reason, researchers, the faculty, the institute and sponsors face the challenge of building a supportive system in order to produce quality researches that are ethical, rather than focus on merely producing publications for high impact factor journals.

Suggestion

In conclusion, this study illustrates the fact that the faculty has invested between 103,724.60 and 242,048.79 baht in research and an additional 41,394.44 to 74,043.26 baht per unit of impact factor score for papers published in high impact factor journals. It is also recognized that the faculty should have policies to encourage the researcher to collaborate with international institutions in order to maximize the budget. Seeking research collaboration with international institutions would enable specialists to work as mentors and share their expertise with faculty staff in specific research fields. Consequently, such collaboration would ensure continued publication of articles in high impact factor journals and in turn enhance the reputation of the faculty.

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งบประมาณด้านการวิจัยกับคุณภาพผลงานวิจัยของคณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ที่ตีพิมพ์ในวารสารระดับนานาชาติในมิติของค่า Impact Factor

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[1]งานบริหารงานวิจัย, [2]ภาควิชาสูติศาสตร์และนรีเวชวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

การศึกษาคุณภาพบทความวิจัยคณะแพทยศาสตร์มหาวิทยาลัยเชียงใหม่ที่ตีพิมพ์ในวารสารวิชาการนานาชาติที่ปรากฏในระบบข้อมูลมาตรฐานที่ตีพิมพ์ในช่วงปี พ.ศ. 2553-2555 ในมิติของค่า Impact factor นั้น พบว่าค่า Impact factor ของวารสารส่วนใหญ่จะมีค่าอยู่ในช่วงระหว่าง 0-3 ผลงานของภาควิชาปรีคลินิก ที่มีผลงานวิจัยตีพิมพ์ในวารสารที่มีค่า Impact factor สูงมากกว่า 3 ขึ้นไป เป็นส่วนใหญ่ คือ ภาควิชาจุลชีววิทยาและสรีรวิทยา คือ ร้อยละ 41.7 และ 35.2 ของจำนวนผลงานในภาควิชา ส่วนภาควิชาทางคลินิก ที่มีผลงานวิจัยที่ได้ตีพิมพ์ในวารสารที่มี ค่า Impact Factor สูงมากกว่า 3 ขึ้นไปเป็นส่วนใหญ่ คือ ภาควิชาอายุรศาสตร์ กุมารเวชศาสตร์ และเวชศาสตร์ชุมชน คือ ร้อยละ 44.1,30.5 และ 31.6 ของจำนวนผลงานในภาควิชาและเมื่อพิจารณาผลงานของทั้ง 21 ภาควิชา โดยดูจากผลงานวิจัยที่มีค่า Impact factor สูงสุดของแต่ละภาควิชา พบว่า เกิดจากความร่วมมือในการทำวิจัยกับต่างสถาบันในระดับนานาชาติเป็นส่วนใหญ่

คณะแพทยศาสตร์ได้มีค่าใช้จ่ายต้นทุนสำหรับการผลิตงานวิจัย 1 เรื่อง อยู่ระหว่างประมาณ 104,000-242,000 บาท และมีค่าใช้จ่ายต่อหนึ่งหน่วย ของค่า Impact factor อยู่ระหว่าง 41,400-74,000 บาท ดังนั้นหากจะผลักดันให้การทำงานวิจัยมีผลงานเพิ่มมากขึ้น ทั้งในด้านจำนวนผลงานวิจัยและค่า Impact factor ของวารสารที่ตีพิมพ์มีค่าสูง ๆ นั้น แนวทางหนึ่งที่คณะแพทยศาสตร์ควรพิจารณาคือ นอกเหนือจากที่คณะแพทยศาสตร์ดำเนินการสนับสนุนแล้ว คณะแพทยศาสตร์ควรให้ความสำคัญกับนโยบายเชิงพัฒนาเพื่อให้เกิดการทำวิจัยร่วมกับสถาบันต่างประเทศซึ่งมีผู้เชี่ยวชาญให้คำปรึกษา ที่มีประสบการณ์ หรือมีความเชี่ยวชาญในสาขาวิชานั้น ๆ เป็น Mentor เพื่อผลักดันให้นักวิจัยได้มีโอกาสแลกเปลี่ยนองค์ความรู้และประสบการณ์และนำมาซึ่งการได้ตีพิมพ์ในวารสารระดับนานาชาติที่มี ค่า Impact factor สูงและยังเป็นการเผยแพร่ซึ่งชื่อเสียงของคณะแพทยศาสตร์ได้แบบยั่งยืนด้วย **เชียงใหม่เวชสาร 2557;53(4):167-74.**

คำสำคัญ: งบประมาณด้านการวิจัย ค่า Impact factor