

Impacts of international collaboration on the quality of researches published in International Academic Journals from the Faculty of Medicine, Chiang Mai University

Kittika Kanjanaratanakorn,¹ and Kittipat Charoenkwan²

¹Research Administration Section, ²Department of Obstetrics and Gynecology, Faculty of Medicine, Chiang Mai University

A total number of 1,540 research papers were written from the Faculty of Medicine, Chiang Mai University, and published in international journals between 2010 and 2014, as presented in the Web of Science, SCOPUS, and PubMed databases. From the total number of published papers, 630 involved international collaboration. The proportion of multilateral and bilateral research was 53.80 and 46.20 percent, respectively. Twenty five point three percent of multilateral researches received support from research institutions, 18.1 percent reached completion through collaboration with non-profit organizations, and 10.3 percent were funded by medical supply companies in the private sector.

The top three countries collaborating in research with the Faculty of Medicine were Japan, the United States, and the United Kingdom. The top three international institutions that collaborated in research with the Faculty of Medicine were The University of Tokyo, Nihon University, and Nara Medical University. Most of the research papers were published by the Pre-clinical Departments. The top three institutions that collaborated in research publication with the Clinical Department were John's Hopkins University, University of Medical Center, Utrecht, The Netherlands and Erasmus Medical Center, The Netherlands.

Research quality was evaluated based on the average number of citations per publication through international collaboration, which was 26.54, 53.17, 10.17, 15.56 and 1.66 in 2010, 2011, 2012, 2013 and 2014, respectively. On the other hand, the average number of citations per publication generated from domestic collaboration did not exceed 5.04 during the same years. The average number of citations per publication during each of the five years had a statistically significant variation, with $p < 0.001$ in both international and domestic collaborations. Research papers supported by private and non-profit organizations were written mostly for clinical, drug, and medical product testing; with their average citations per publication being higher than those from domestic institutional, multilateral, bilateral, and researcher's institutional collaboration.

Research quality was assessed by the number of citations per publication that revealed statistically significant variations between international and domestic collaboration, and research papers completed through international collaboration yielded the higher value. It is therefore imperative to develop policies with clear strategies to support research collaboration with international institutions. Campaigns to develop researcher competency should be developed, as well as financial and resource support for researchers. Sustainable opportunities for researchers to train and improve research projects with international institutions should be provided. Furthermore, opportunities to collaborate with private organizations in developing commercial research projects to international standards should be encouraged. These efforts would produce researches that can improve quality of life and lead to the sustainable development of mankind. **Chiang Mai Medical Journal 2015;54(4):171-83.**

Keywords: international collaboration, research quality

Introduction

When ranking Thai universities, organizations such as QS World University Ranking and The Times Higher Education World University Ranking (THE) should utilize academic project indicators, research citations per faculty and the degree of international research for quality evaluation. SCImago Institution Ranking ranks institutions that produce international research, based on the number of papers they publish and citations in SCOPUS. Factors for evaluation include output (number of researches in academic papers), peer-reviewed international collaboration (number of researches published in collaboration with other institutions, proportionate to the total number of researches published), normalized impact (percentage of research citations from the institution compared with the global average of total research citations), and high quality publications (percentage of researches published in leading journals, ranked in the top 25% of the Journal Rank SJR indicator). In 2014, SCImago Institution Ranking ranked Chiang Mai University as third in Thailand and 878 worldwide. Interestingly, the Faculty of Medicine, Chiang Mai University, published a high number of researches in international journals. Therefore, the number of researches conducted by this Faculty serves as an essential variable in determining the ranking direction of the university. Analyzing the impacts of international collaboration on the role of researches published in international journals—both in terms of research quantity (number of researches published) and quality (citations made for academic purposes and recorded in credible databases)—will produce valuable results that support strategic planning for the systematic development of international research.

In recent years, international scientific collaboration has been perceived as enhancement of academic institute capability that should be encouraged^[1]. Collaboration can be beneficial for several reasons, such as promoting feedback and joint research projects, as well as sharing research facilities, research data and discoveries. Collaboration also plays

a positive role in the research citation rate, which indicates the quality of articles and institutional recognition.

Previous studies demonstrated that the number of clinical studies with international collaboration increased significantly in Malaysia between 2001 and 2010, and they were published in high impact factor journals^[2]. Furthermore, the number of international research collaborations increased more rapidly in China^[3]. Indian-International research collaboration resulted in greater institutional recognition and productivity^[4]. The impact of international collaboration on research performance has been accumulating; biomedical publications with international co-authors are of higher impact and more productive than their domestic counterparts. Other studies report similar findings^[5-13]

However, several studies showed contradictory evidence in that scientific collaboration had no significant impact on the citation rates of publications, when compared to single-authored papers^[14-15]. Policymakers have argued for a more symmetrical approach in comparing the costs of collaboration with undoubted benefits, when considering policies towards research collaboration^[16].

European and American researchers were alike in collaborating with researchers in some of the smaller research nations, even when it did not improve the impact of citations in those countries^[17].

International scientific collaboration is particularly advantageous for less advanced countries, but also beneficial for highly industrialized countries^[18-19].

In addition, the average impact of international collaborative work is significantly higher than the overall average^[20], especially in biological sciences, where there was a net gain on impact in 30 of the 49 country-field combinations analyzed^[21].

Statistics of researches published in international databases between 2002 and 2014 from the Faculty of Medicine, Chiang Mai University showed a continually increasing trend. Three hundred and fifty two research papers were published during 2014; an increase from 136 papers in 2002. Factors that led to this

growth include the systematic research support (including financial support) from the Faculty and effective collaboration between institutions or groups, which improved the chance of international research publishing significantly. When considering the number of citations made from collaborative research; the list of institutions performing these researches with the university, faculties that engaged in significant collaboration, and quality of research papers produced will equip the Faculty with information for selecting parties (faculties, institutions, or researchers) that can develop its research to sustainable international standards.

Objectives

1. To study the number of research articles published in international journals, resulting from international research collaboration.
2. To study the quality of the research articles in terms of citations made for academic purposes.
3. To study the number of institutional research collaborations with the Faculty of Medicine, Chiang Mai University.

Methods

Study design: Cross-sectional descriptive study

Data Collection

All of the researches conducted by the Faculty of Medicine, Chiang Mai University, and published in international journals between 2010 and 2014 were included in this study. Only three types of publications (Articles, Review Articles and Papers on Proceedings) were considered. The data were collected by entering the full names of researchers and their department within the Faculty of Medicine into the system. The number of citations, names of collaborating institutions and their countries of origin also were recorded. The citations of each research topic were searched and recorded simultaneously.

Definition

- International collaboration^[22]: Co-authorship was likely a good indicator of collaboration among countries, although there were collaborations that did not result in co-authored papers; and some co-authored papers might have required limited collaboration. Multiple affiliations were considered as cooperation and this could distort the result.

Publications affiliated only to the Faculty of Medicine, Chiang Mai University, and one single country were called "bilateral", whereas those containing additional countries were indicated as "multilateral".

- Quality of a research^[23] was measured by the citation rate over the years following the year of publication.
- The total number of citations was from published articles analyzed by an analyzing unit during the time span of the analysis.

Where P = number of publications

C_i = number of citations for publication i

$$C = \sum_{i=1}^P c_i$$

Data analysis

1. The number of citations from international collaborative researches published in academic journals and recorded in credible databases was studied. A list of institutions that engaged in research collaboration with the Faculty of Medicine was made. The information was presented as descriptive statistics in terms of average percentages and comparative graphs.
2. Research quality in terms of academic citations, categorized by various types of collaborations, was compared by using the Kruskal Wallis statistical test.

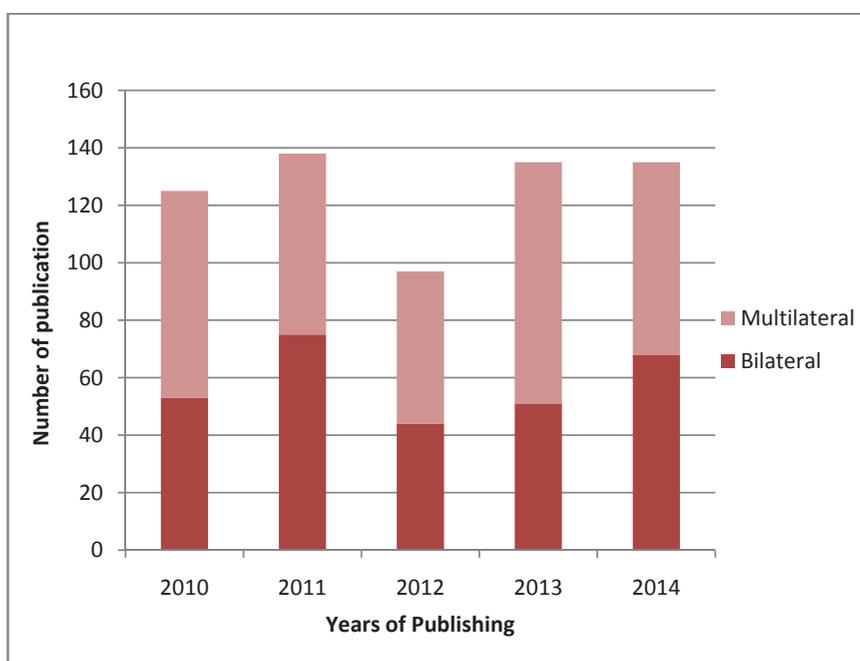
Results

1. Quantity of research papers published in international journals under international research collaboration

A total of 1,540 research papers were published in international journals by the Faculty of Medicine, Chiang Mai University, between 2010 and 2014, as presented in Web of Science, SCOPUS, and PubMed databases. From the total number of published papers, 953 were collaborated domestically, while 630 were international collaborations. The proportion of multilateral and bilateral research under international collaborative research was 53.80 (339 projects) and 46.20 percent (291 projects), respectively. Twenty five point three percent (160 projects) of multilateral researches were supported by researchers' institutions, while 18.1 percent (114 projects) were completed as a collaboration network with non-profit organizations, and a total of 10.3 percent (65 projects) was funded by medical supply companies in the private sector. The information is displayed in Table 1.

Table 1. International collaborative research categorized by types of collaboration and year of publishing

Types of collaboration	2010	2011	2012	2013	2014	Total
Bilateral	53	75	44	51	68	291 (46.20%)
Multilateral						
▫ Supported by researchers' institutions	72	63	53	84	67	339 (53.80%)
▫ Supported by non-profit organizations	37	28	35	41	19	160 (25.30%)
▫ Supported by medical supply companies in the private sector	25	12	12	28	37	114 (18.10%)
Total	125	138	97	135	135	630

**Figure 1.** Number of publications in international journals categorized by year of publishing and type of collaboration.

List of the Top 10 Countries that Engaged in Research Collaboration with the Faculty of Medicine, Chiang Mai University

Of all the international collaborative researches (630 papers), most of them were in the multilateral category. The top two countries that collaborated in research with the Faculty of Medicine were the United States of America and Japan. Details are displayed in Figure 2.

Number of publications and citations from international journals of the Faculty of Medicine, Chiang Mai University

When dating back from 2014 to the earliest

year of publishing, 491 research papers (out of 630 papers) were cited, which is equivalent to 77.9 percent. Analysis of the publications cited in each year revealed that more than 80 percent of them were cited in most years, except for 2014, when only 46.7 percent were cited. The information is shown in Table 2.

Research Paper Citations

The average number of citations per publication varies directly to the number of years of being published. In order to process the data accurately within these conditions, the researchers analyzed the number of citations

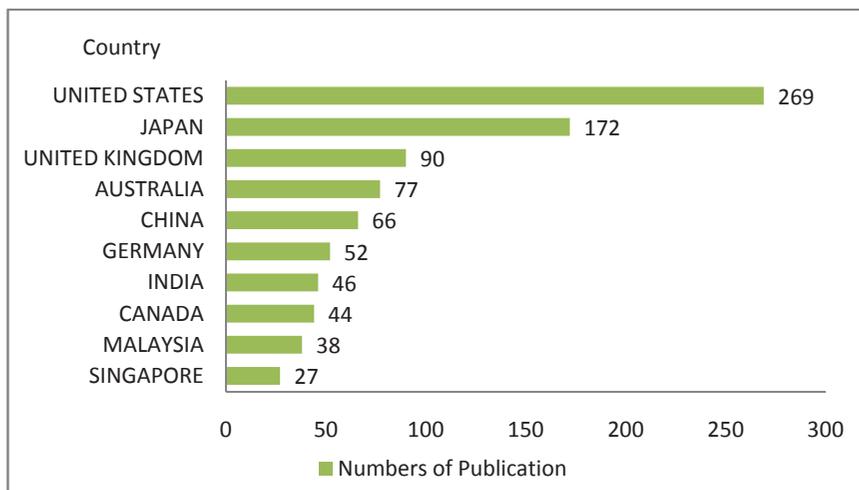


Figure 2. Top 10 Countries that engaged in research collaboration with the Faculty of Medicine, Chiang Mai University.

Table 2. The number of publications and categorized citations based on Year of publishing.

Year	2010	2011	2012	2013	2014	Total
Number of research papers	125	138	97	135	135	630
Number of citations (percentages)	117 (93.6)	119 (86.2)	82 (84.5)	110 (81.5)	63 (46.7)	491 (77.9)

in each year simultaneously. Regarding international research collaboration, multilateral research was categorized, based on the sources of funding, which were researchers' institutions, non-profit organizations, and companies in the private sector.

Of all international collaborative research papers published by the Faculty of Medicine (630 papers), 563 were in the SCOPUS database, 47 in the Web of Science database and 20 in the Pubmed database. Since data for the 20 papers in Pubmed were unavailable, the study of citations per publication was for 610 papers, of which 491 were cited. Of the 953 papers on domestically collaborated researches, 919 were cited. It is therefore possible to calculate the average number of citations per publication in each publishing year. These figures are presented in Table 3.

Comparing Research Citations based on Types of Collaboration

Comparison was made of the average number of citations for international (630 pa-

pers) and domestic collaborative researches (953 papers), as presented in credible databases categorized by publishing year (until year 2014). It was found that the average number of citations for international collaborative research was significantly greater than that of domestic collaborative research, as displayed in Table 3. Since international collaborative research is categorized into multilateral and bilateral projects, which received financial support from various sources (researchers' institutions, non-profit organizations, and organizations of the private sector), citations per publication were calculated after taking these contexts into consideration. The information is presented in Table 4.

Analyzing the citations per publication in each year (as displayed in Table 4) indicated a significant difference ($p < 0.001$) between domestic and international collaborative research (both multilateral and bilateral researches receiving funding from various sources) during 2010. Similarly, the difference was significant

Table 3. The average number of citations from research papers written by the Faculty of Medicine in each publishing year.

Index	2010	2011	2012	2013	2014
Number of publications					
• Domestic collaboration	165	186	178	208	216
• International collaboration	119	138	96	133	124
Number of publications that were cited					
• Domestic collaboration	161	183	173	197	205
• International collaboration	117	119	82	110	63
Number of citations					
• Domestic collaboration	833	886	594	361	123
• International collaboration	3,158	7,338	976	2,070	206
Average number of citations					
• Domestic collaboration	5.04	4.76	3.33	1.73	1.75
• International collaboration	26.54	53.17	10.17	15.56	1.66

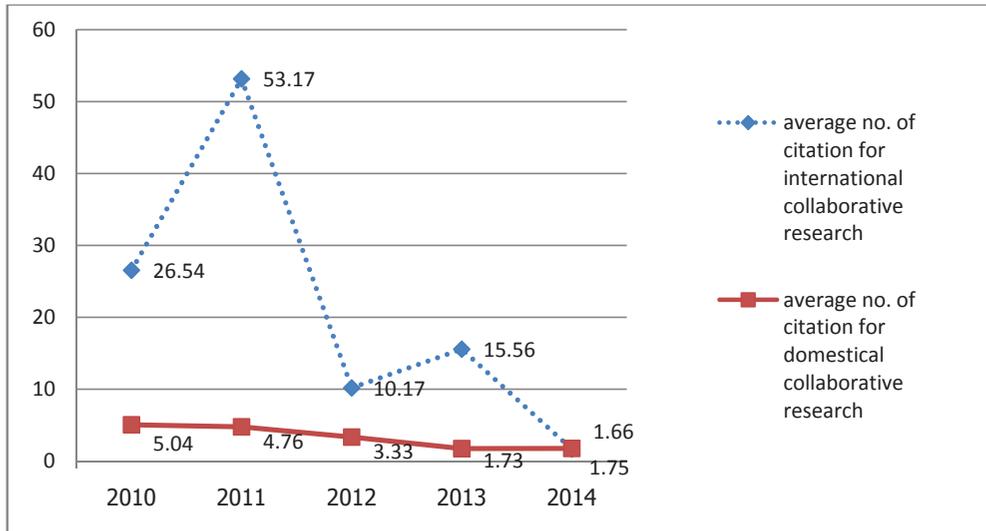


Figure 3. Comparison of average citations for international and domestic collaborative research.

between 2011 and 2014. The average number of citations from research papers funded by non-profit organizations and the private sector was higher, due to the nature of those organizations to support researches as a globally collaborative network. This highly collaborative nature led to high rates of academic citations by researchers in related industries worldwide—a factor considered as a norm in the academic industry.

Number of research papers published in international journals categorized by Departments

The Department of Internal Medicine produced the highest number of international collaborative researches, with a total of 120 papers (19 percent), followed by the Department of Microbiology with a total of 86 projects (13.7 percent.) The departments with the highest citation rates were orthopedics, pharmacology, pathology, and psychiatry—with percentages

Table 4. The average number of citations from research categorized by types of collaboration and publishing year

Publishing year	Types of collaborations	Number of publications	Total number of citations	Average number of citations (mean ± SD)	<i>p-value</i>
2010	Domestic institutions	161	833	5.17±6.43	<0.001*
	International institutions				
	Bilateral	48	594	12.38±13.60	
	Multilateral				
	• Support from researchers' institutions	37	636	17.17±39.74	
2011	• Support from non-profit Organizations	25	1,615	64.60±204.75	
	• Support from medical supply companies	9	313	34.78±41.33	
	Domestic institutions	183	886	4.84±6.87	
	International institutions	75	723	9.64±13.65	
	Bilateral				
2012	Multilateral				
	• Support from researchers' institutions	28	233	8.32±7.65	<0.001*
	• Support from non-profit Organizations	12	234	19.50±24.06	
	• Support from medical supply companies	23	6,148	267.30±540.86	
	Domestic Institutions	173	594	3.43±4.55	
2013	International institutions				
	Bilateral	44	246	5.59±6.70	
	Multilateral				
	• Support from researchers' institutions	35	340	9.83±30.70	<0.001*
	• Support from non-profit Organizations	12	177	14.75±22.25	
2014	• Support from medical supply companies	6	213	35.50±28.85	
	Domestic institutions	197	361	1.83±2.84	
	International institutions				
	Bilateral	49	221	4.51±12.12	
	Multilateral				
2014	• Support from researchers' institutions	37	636	4.66±11.96	<0.001*
	• Support from non-profit Organizations	25	1,615	8.18±11.62	
	• Support from medical supply companies	9	313	95.27±110.35	
	Domestic institutions	205	123	0.60±1.10	
	International institutions				
2014	Bilateral	75	723	0.51±1.16	
	Multilateral				
	• Support from researchers' institutions	28	233	1.22±1.96	<0.001*
	• Support from non-profit Organizations	12	234	4.23±5.99	
	• Support from medical supply companies	23	6,148	0.50±0.84	

* Conducted by the Kruskal Wallis test at 0.05 level of significance

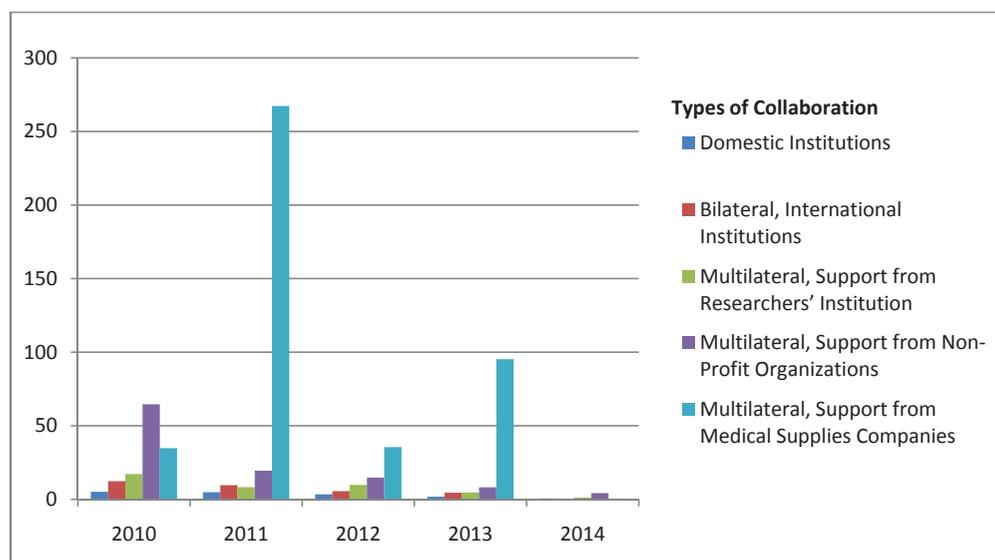


Figure 4. Average number of citations categorized by types of collaboration and publishing year.

Table 5. Number of research papers published in international journals categorized by departments

Department	Number of research papers (%)	Number of citations	Percentages of citations
Anatomy	28 (4.4)	20	71.4
Pediatric	31 (4.9)	20	64.5
Ophthalmology	28 (4.4)	20	71.4
Psychiatry	25 (4.0)	22	88.0
Microbiology	86 (13.7)	72	83.7
Biochemistry	44 (6.9)	35	79.5
Forensic Medicine	10 (1.5)	6	60
Parasitology	57 (9.0)	38	66.7
Pathology	21 (3.3)	19	90.5
Pharmacology	10 (1.5)	10	100.0
Radiology	15 (2.3)	13	86.7
Anesthesiology	7 (1.1)	4	57.1
Family Medicine	21 (3.3)	14	66.7
Community Medicine	33 (5.2)	27	81.8
Rehabilitation Medicine	12 (1.9)	10	83.3
Surgery	22 (3.4)	14	63.6
Physiology	23 (3.4)	19	82.6
Obstetrics and Gynecology	22 (3.4)	19	86.4
Otolaryngology	3 (0.5)	2	66.7
Orthopedics	12 (1.9)	12	100.0
Internal Medicine	120 (19.0)	95	79.2
Total	630		

of 100, 100, 90.5, and 88.0, respectively. The researches of the two departments with the largest number of internationally collaborated projects—internal medicine and microbiology

— had citation rates of 79.2 percent and 83.7 percent, respectively. The information is presented in Table 5.

Table 6. The Top Five cited research papers categorized by department and publishing year

Publishing year	Rank	Number of citations	Department	Type of collaboration / Support organization
2010	1	1,041	Community Medicine	Multilateral / Non-profit
	2	245	Microbiology	Multilateral / Researchers' institutions
	3	122	Internal Medicine	Multilateral / Private sector
	4	88	Otolaryngology	Multilateral / Non-profit
	5	69	Pediatric	Multilateral / Non-profit
2011	1	1,976	Internal Medicine	Multilateral / Private sector
	2	1,814	Community Medicine	Multilateral / Private sector
	3	708	Internal Medicine	Multilateral / Private sector
	4	360	Internal Medicine	Multilateral / Private sector
	5	298	Surgery	Multilateral / Private sector
2012	1	184	Community Medicine	Multilateral / Researchers' institutions
	2	81	Community Medicine	Multilateral / Non-profit
	3	75	Internal Medicine	Multilateral / Private sector
	4	67	Internal Medicine	Multilateral / Private sector
	5	31	Internal Medicine	Multilateral / Private sector
2013	1	337	Internal Medicine	Multilateral / Private sector
	2	256	Internal Medicine	Multilateral / Private sector
	3	255	Internal Medicine	Multilateral / Private sector
	4	204	Internal Medicine	Multilateral / Private sector
	5	146	Internal Medicine	Multilateral / Private sector
2014	1	24	Community Medicine	Multilateral / Non-profit
	2	21	Anesthesiology	Multilateral / Non-profit
	3	15	Community Medicine	Multilateral / Non-profit
	4	10	Internal Medicine	Multilateral / Non-profit
	5	10	Community Medicine	Multilateral / Non-profit
		10	Internal Medicine	Multilateral / Non-profit

From an aggregate perspective, the five most cited research papers in each year were multilateral researches supported by non-profit organizations or medical supply organizations in the private sector, which motivated researchers worldwide to collaborate in order to produce effective results. These researches require systematic management networks as well as significant resources and investment. The majority of these researches are for clinical trials, which involves testing of medicine and medical supplies for their effectiveness. Therefore, the majority of researchers responsible for this research under the Faculty of Medicine were from Clinical Departments, with the minority coming from the Pre-Clinical Department. The information is presented in Table 6.

Foreign Institutions that had Research Collaboration with the Faculty of Medicine – a Focus on Collaboration that received Support from Researchers' Institutions

Studies indicated that multilateral researches, which were supported by collaborative networks of non-profit organizations or the private sector, were systematically organized internationally. Researchers in various institutions agreed to establish clear research protocols. These research papers had a higher number of citations per publication than bilateral researches and those supported by the researchers' institutions. It is therefore worthwhile to study bilateral research or researches funded by the researchers' institutions, since they originate from collaborative efforts between researchers from different institutions, leading to sustainable results from their joint efforts.

Table 7. The top three institutions that collaborated with the pre-clinical and clinical departments for research publication

Department	Rank	Institutions	Number of publications
Pre-clinic	1	The University of Tokyo, Japan	21
	2	Nihon University, Japan	17
	3	Nara Medical University, School of Medicine, Japan	15
Clinic	1	John Hopkins University, Bloomberg Public School, USA	12
	2	University of Medical Center, Utrecht, The Netherlands	10
	3	Erasmus Medical Center, The Netherlands	8

The researchers gathered collaborative projects that were published with other institutions between 2010 and 2014. The top three international institutions that collaborated with the Faculty of Medicine for research publications were The University of Tokyo, Nihon University, and Nara Medical University. Most of these researches were completed by the Pre-clinical Department. The top three institutions that collaborated with the Clinical Department in publishing research papers included John Hopkins University, Bloomberg, University of Medical Center, Utrecht, The Netherlands, and Erasmus Medical Center, The Netherlands. The information is presented in Table 7.

Conclusion

The majority of international collaborative researches from the Faculty of Medicine received support from the researchers' institutions, and were initiated from research questions proposed by the personnel of the institution. These researches were executed by researchers with a common interest. The research papers may be completed with the support of advisors or specialized studies from overseas. This manner of research implementation benefits new researchers or students^[24,25] by providing knowledge, experience, and research techniques that lead to expertise. It fosters the sustainable development of research teams with the potential to collaborate effectively in the long term.

The international collaborative researches of the faculty have the highest citations per publication, where multilateral researches are supported by the private sector or non-profit

organizations in the form of collaborative networks. Most of these researches serve the objective of clinical trials to test the effectiveness of medicine or medical equipment for commercial applications. Private sector organizations generally provide financial support, while non-profit organizations tend to support research that leads to globally applicable results for illness prevention and diagnosis. These researches require significant resources and funding. Once completed, the research leads to benefits for all stakeholders. The faculty benefits from human resource development, where personnel receive the opportunity to conduct research while maintaining good research practices. It also receives recognition and good reputation from the research. The personnel of the faculty develop their capabilities from working with other international organizations, and exchanging their knowledge with other professionals worldwide. Multi-country collaboration leads to significant citations per publication^[26], which are used as an indicator for evaluating the institution's research quality and institutional ranking of the Faculty of Medicine. Research funded by private sector and non-profit organizations generally asks questions pertaining to medical supplies or health sciences^[27].

Once a research is completed, its supporters reserve the right to publish or not publish the work. Supporters of published articles also reserve the right to include or not include the researchers as co-authors, depending on the initial agreement^[28]. Therefore, research funded by private sector organizations usually serve to answer research questions that did not originate from the researchers or their

institutions. These researches are also under ownership of the supporters, and the faculties and institutions conducting the research seldom gain direct benefits from the work.

Strengthening international collaborative research requires sustainable support. The Faculty should emphasize the following three facets of support, which are referred to as 3F:

- Full time: The Faculty needs full-time researchers to be responsible for the projects.
- Full commitment: The Faculty needs full resources to support international collaborative research efforts.
- Full funding: The Faculty needs sufficient funding for supporting research collaboration that effectively meets the objectives of the project

A variety of actions can be implemented, including:

A. The research mentor system should be established together with a tangible research cluster. The Faculty should support personnel development from research investigators to senior investigators, which will serve to sustain development of the Faculty's research quality at the international level. Financial support can be provided to allow researchers of the Faculty to develop research questions with those from international institutions^[29]. Research networks can be developed by inviting overseas experts to share experiences with the Faculty's personnel in order to bolster research quality.

B. Clinical research should be supported to become comprehensive, with performances that meet international standards. This would lead to research projects that provide valuable knowledge or new discoveries. The Faculty should develop clear strategies for international collaboration by providing financial support to increase its strength. The University should become a research and development center for providing knowledge to society and the community, using international collaboration to resolve problems encountered by underprivileged community members.

Objectives

1. Establish a training program to develop researchers into owners of clinical research projects. The Faculty should support the sustainable development of experiments to have quality that meets international standards.

2. Control systems to evaluate the quality of personnel, after which a training program should be established to ensure standards are met (e.g. Good Clinical Practice^[30]).

3. Improve the work system of clinical research teams of the Faculty to meet international standards, leading to increased research recognition and international support. This also would prepare the Faculty for increased competition with new clinical research organizations, at both domestic and international levels.

These efforts would help the Faculty to produce research projects that can be applied to improve the quality of life for mankind, and lead to sustainable development of the human population.

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ความร่วมมือด้านการวิจัยกับนานาชาติต่อคุณภาพผลงานวิจัยของคณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ ที่ตีพิมพ์ในวารสารวิชาการนานาชาติ

กิตติกา กาญจนรัตน์¹ และ กิตติภัต เจริญขวัญ²

¹งานบริหารงานวิจัย, ²ภาควิชาสูติศาสตร์และนรีเวชวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

ผลงานวิจัยของคณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ ที่ได้ตีพิมพ์ในวารสารนานาชาติที่ปรากฏในฐานข้อมูล Web of Science, SCOPUS, และ PubMed ในช่วงปี พ.ศ. 2553-2557 จำนวนทั้งหมด 1,540 เรื่อง พบว่าเป็นผลงานวิจัยที่มีความร่วมมือกับนานาชาติ จำนวน 630 เรื่อง โดยเป็นการร่วมทำวิจัยในลักษณะ พหุภาคีสูงสุดร้อยละ 53.8 และทวิภาคี ร้อยละ 46.20 สำหรับความร่วมมือแบบพหุภาคีพบว่าเป็นผลงานวิจัยที่เกิดจากการสนับสนุนของสถาบันที่นักวิจัยสังกัด ร้อยละ 25.3 เป็นผลงานวิจัยที่เกิดในลักษณะสห สถาบัน ภายใต้การสนับสนุนขององค์กรที่ไม่หวังผลกำไร ร้อยละ 18.1 และเป็นโครงการที่เกิดจากการสนับสนุนของ บริษัทผู้ผลิตเวชภัณฑ์ภาคเอกชน ร้อยละ 10.3 ตามลำดับ รายชื่อประเทศ 3 อันดับแรกที่มีจำนวนนักวิจัยร่วมทำงานวิจัยกับคณะแพทยศาสตร์สูงสุดคือ สหรัฐอเมริกา ญี่ปุ่น และสหราชอาณาจักร และสถาบันในต่างประเทศที่ให้การสนับสนุนจนมีผลงานวิจัยตีพิมพ์ร่วมอย่างต่อเนื่องกับคณะแพทยศาสตร์สูงสุด 3 อันดับแรกคือ The University of Tokyo, Nihon University และ Nara Medical University ซึ่งส่วนใหญ่เป็นผลงานของภาควิชาพรีคลินิก ในขณะที่ผลงานวิจัยของภาควิชาทางคลินิกจะมีความร่วมมือสูงสุด 3 อันดับแรกกับ John Hopkins University, Bloomberg Public School, University of Medical Center, Utrecht, Netherlands และ Erasmus Medical Center, Netherlands

เมื่อพิจารณาคุณภาพของผลงานวิจัยจากค่าจำนวนครั้งการถูกนำไปใช้อ้างอิงโดยเฉลี่ยพบว่า ในปี พ.ศ. 2553 จนถึงปี พ.ศ. 2557 มีค่าจำนวนครั้งการอ้างอิงโดยเฉลี่ย (citation per publication) 26.54, 53.17, 10.17, 15.56 และ 1.66 ครั้ง ตามลำดับ ในขณะที่จำนวนครั้งการอ้างอิงโดยเฉลี่ยของผลงานวิจัยซึ่งร่วมมือกับสถาบันในประเทศ ในช่วงเวลาเดียวกันมีค่าสูงสุดไม่เกิน 5.04 และในแต่ละปีเมื่อเปรียบเทียบค่าเฉลี่ยการอ้างอิงค่า (citation per publication) ของผลงานวิจัยที่มาจากแต่ละประเภทของความร่วมมือ พบว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติด้วย $p < 0.001$ โดยผลงานวิจัยจากการสนับสนุนจากภาคเอกชน หน่วยงานที่ไม่หวังผลกำไร ซึ่งส่วนใหญ่จะเป็นการวิจัยและพัฒนาเพื่อการทดลองทางคลินิก การทดสอบประสิทธิภาพและประสิทธิผลของยาและเวชภัณฑ์ต่าง ๆ มีค่าเฉลี่ยการถูกนำไปใช้อ้างอิงสูงกว่ากลุ่มที่เป็นความร่วมมือกับสถาบันในประเทศ กลุ่มที่มีความร่วมมือในลักษณะทวิภาคี และในกลุ่มที่ได้รับการสนับสนุนจากสถาบันที่นักวิจัยสังกัด

จากการที่คุณภาพผลงานวิจัยโดยดูจากค่าการถูกนำไปอ้างอิง ของงานวิจัยที่มีความร่วมมือกับนานาชาติจะมีค่าสูงกว่าการร่วมมือกับสถาบันในประเทศอย่างมีนัยสำคัญ ดังนั้นการมีนโยบายสนับสนุนให้นักวิจัยของคณะ ได้มีโอกาสทำงานวิจัยร่วมกับสถาบันระดับนานาชาติ โดยกำหนดยุทธศาสตร์ที่ชัดเจนในการทำงานวิจัยร่วมกับนานาชาติ การมีระบบพัฒนานักวิจัย การสนับสนุนทุนและทรัพยากรวิจัยอย่างเต็มที่ การเปิดโอกาสให้นักวิจัยได้มีโอกาสฝึกฝนและพัฒนาโครงการวิจัยร่วมกับนานาชาติอย่างต่อเนื่อง โดยเฉพาะการร่วมมือกับหน่วยงานภาคเอกชนในการพัฒนาผลงานวิจัยไปสู่การใช้ในเชิงพาณิชย์ได้จริง จนสามารถเป็นที่ยอมรับของนานาชาติได้ ย่อมนำมาซึ่งผลงานวิจัยที่นำไปสู่การพัฒนาคุณภาพชีวิตของประชากร และก่อให้เกิดการพัฒนาอย่างยั่งยืนต่อประชากรโลกเป็นสำคัญ **เชียงใหม่เวชสาร 2558;54(4):171-83.**

คำสำคัญ: ความร่วมมือกับนานาชาติ คุณภาพผลงานวิจัย

