

Academic Achievements of Doctors Who Studied at A Domestic Institute for Clinical Medicine

Chang-Chun Hsiao, PhD; Ming-Huei Chou, MS; Jiin-Haur Chuang¹, MD

Background: The purpose of this study was to investigate the outcomes of doctors who studied at a graduate degree program at a domestic institute for clinical medicine.

Methods: The academic results of 45 doctors who studied at the Graduate Institute of Clinical Medical Sciences- Kaohsiung Branch (GICMS-KB) of Chang Gung University (CGU) were analyzed and compared with those of 83 doctors who had studied abroad or at domestic institutions other than CGU (non-CGU), as well as with 263 who did not pursue further graduate studies (no GS) during the study period from 2003 to 2007. The 128 doctors who had pursued graduate study were sent a survey consisting of 6 questions about factors which hamper research activity.

Results: The average number of Science Citation Index (SCI) articles published by the doctors of GICMS-KB as the first author over five years was 3.16 ± 0.52 , which was significantly higher than 1.51 ± 0.22 in the no GS group ($p = 0.005$) and 2.31 ± 0.39 in the non-CGU group. The average number of research grants was 3.62 ± 0.64 in GICMS-KB group, which was higher than 1.57 ± 0.28 in the non-CGU and 1.56 ± 0.20 in the no GS groups ($p < 0.001$ in both). The percentage of the doctors with faculty positions was 58% in GICMS-KB group, higher than 43% in the non-CGU and 38% in the no GS groups, with a p value of 0.055 comparing GICMS-KB with the no GS group. The survey indicated that all doctors who pursued post-graduate training had similar problems, such as lack of time and lack of research manpower with no difference between the GICMS-KB and non-CGU groups.

Conclusion: The academic performance of doctors who did postgraduate study at our graduate institute for clinical medicine was generally better than those who did not pursue further graduate studies or those with postgraduate studies outside CGU. Factors such as adaptation of the GICMS-KB doctors to our system and policies which include enforced grant writing and publication for graduation during the training course may account for the difference.

(*Chang Gung Med J* 2011;34:153-9)

Key words: clinical medicine, graduate study, publication, research, faculty position

From the Graduate Institute of Clinical Medical Sciences-Kaohsiung Branch, College of Medicine, Chang Gung University, Taoyuan, Taiwan; ¹Division of Pediatric Surgery, Chang Gung Memorial Hospital - Kaohsiung Medical Center, Chang Gung University College of Medicine, Taoyuan, Taiwan.

Received: Apr. 9, 2010; Accepted: Sep. 8, 2010

Correspondence to: Dr. Jiin-Haur Chuang, Division of Pediatric Surgery, Chang Gung Memorial Hospital - Kaohsiung Medical Center, 123, Dapi Rd., Niasong Township, Kaohsiung County 833, Taiwan (R.O.C.) Tel.: 886-7-7317123 ext. 8811;

Fax: 886-7-7338009; E-mail: jhchuang@cgmh.org.tw

The Graduate Institute of Clinical Medical Sciences- Kaohsiung Branch (GICMS-KB), Chang Gung University (CGU) was established in 1997 by the then Director of GICMS and the Dean of College of Medicine, Dr. Ying-Shiung Lee. It was very convenient for doctors at Chang Gung Memorial Hospital-Kaohsiung Medical Center (CGMH-KMC) to enroll in graduate studies without the need to go to the main campus at Linko, 320 km away. Although the teachers and faculty members at the Kaohsiung Branch were not the same as those at the main campus, the courses and standards for graduation were the same. We therefore provided a facility similar to an independent graduate institute for clinical medicine, which was well suited for translational research, i.e., taking important clinical questions to the bench and/or bringing important bench discoveries back to the bedside. We started with the program for a Master of Science in clinical medicine, and the PhD program was adopted one year later.

The importance of graduate study or post-graduate training in advancement of clinical science has been recognized in several reports. Kuo et al found that physicians with a PhD degree have more projects than those with a master's degree.⁽¹⁾ Ferrer et al. found that doctors with a PhD or an MD-MS are more productive (defined as publications, external presentations, and funded grants) than those with only an MD degree.⁽²⁾ Gordon and Salmon's study suggests that research training leads to more success if it is done during or after the residency than earlier.⁽³⁾ Kearney et al. found that physicians who obtain a PhD after an MD have a more research-focused career (in terms of publications and research grants) than those who enter medical school having already obtained a PhD.⁽⁴⁾ The available information on the results of research work by graduates from graduate institutes of clinical medicine is limited.^(1,5-7)

This study aims to measure the academic achievements of physicians who enrolled in graduate study based on three parameters to test the efficacy of GICMS-KB 10 years after its establishment. While some graduate physicians obtained master's or PhD degrees, many failed to graduate. Regardless of whether or not they finished graduate study, their academic achievements were reviewed. The oldest of these former graduate students had been attending physicians for 19 years (V19) by the end of the study in 2007. We therefore studied doctors at V19 or less

and compared the performance of former graduate students from GICMS-KB with doctors who studied abroad or at other domestic institutions besides CGU, as well as with those who did not pursue further graduate studies.

METHODS

The study included 391 doctors who have been attending physicians at the CGMH-KMC for 19 years (V19) or less. Among them, 45 had studied at the Graduate Institute of Clinical Medical Sciences-Kaohsiung Branch GICMS-KB CGU. Eighty-three doctors had post-graduate training either abroad or at domestic institutes at other universities, which were grouped as "non-CGU". The remaining 263 doctors did not pursue any post-graduate training or graduate study, and were grouped as "no GS". The three academic performance indices used for comparison are the number of cumulative five-year SCI papers from 2003-2007, the number of research grants, and the percentage of doctors with teaching faculty positions at the lecturer level or above. Only SCI papers where the doctors were either the first or corresponding authors were counted. Similarly, only those grants where the doctors were the principal investigators were taken into account.

In order to elucidate if there was a difference in factors which hamper research activity between doctors who had enrolled at GICMS-KB and those who studied outside the institute, we constructed a questionnaire that consisted of 6 questions: lack of time, lack of research manpower, inadequate research space and equipment, lack of hospital administrative or department support, lack of family support, and economic reasons (Table 1). The questionnaire was derived from the report by Kuo et al.⁽¹⁾ All 45 doctors at GICMS-KB and 83 non-CGU graduate students, for a total of 128 doctors, received the anonymous questionnaire. After mailing it to the participants twice, 84 of 128 (65.6%) returned the questionnaire.

We also constructed a questionnaire consisting of 7 questions on motivations to pursue graduate study as follows: for promotion, to increase credit within their own department, to improve knowledge and capability to read updated literature, to increase self-esteem to become an academic physician or academic surgeon, purely for research interest, request by the department to do research or other unspecified

Table 1. Factors Which Hamper Research Activity

Factor	GICMS-KB*	non-CGU†
Lack of time		
Yes	28 (93.3)	52 (96.3)
No	2 (6.7)	2 (3.7)
Total	30 (100)	54 (100)
Lack of research manpower, such as full-time research assistant		
Yes	23 (76.7)	45 (83.3)
No	7 (23.3)	9 (16.7)
Total	30 (100)	54 (100)
Inadequate research space and equipment		
Yes	20 (66.7)	38 (70.4)
No	10 (33.3)	16 (29.6)
Total	30 (100)	54 (100)
Lack of hospital administrative or department support		
Yes	15 (50)	23 (42.6)
No	15 (50)	31 (57.4)
Total	30 (100)	54 (100)
Lack of family support		
Yes	6 (20)	13 (24.1)
No	24 (80)	41 (75.9)
Total	30 (100)	54 (100)
Economic reasons		
Yes	15 (50)	19 (35.2)
No	15 (50)	35 (64.8)
Total	30 (100)	54 (100)

Values are given as No. (%). *: Graduate study at the Graduate Institute of Clinical Medical Sciences-Kaohsiung Branch (GICMS-KB), College of Medicine Chang Gung University (CGU); †: Study abroad or at a domestic institute at other universities.

incentives. A total of 97 doctors received the anonymous questionnaire, and 47 (48.5%) answered it.

We used SPSS version 11.0 (SPSS Inc., Chicago, IL, U.S.A.) for statistical analysis. A comparison of continuous data was performed with a general linear model with post hoc comparisons using the least significant difference test. A *p* value < 0.05 was considered significant.

RESULTS

Among the 391 doctors under V19, 45 (11.5%)

pursued graduate study at GICMS-KB, 83 (21.2%) chose graduate study outside CGU (non-CGU), and 263 (67.3%) had not pursued further graduate study or post-graduate training (no GS) at the time of the study.

The average number of SCI articles published as the first author in the cumulative five-year period from 2003-2007 was 3.16 ± 0.52 for the GICMS-KB group, which was significantly higher than 1.51 ± 0.22 for the no GS group (*p* = 0.005). It was also higher than 2.31 ± 0.39 observed in the non-CGU group, but the difference was not statistically significant (Fig. 1). The average number of SCI articles published as the first and corresponding authors by the doctors from GICMS-KB over five years was 3.87 ± 0.67 , which was higher than 2.75 ± 0.47 in the no GS and 3.13 ± 0.54 in the non-CGU groups.

The average number of research grants in the same five-year period was 3.62 ± 0.64 in the GICMS-KB group, significantly higher than both the non-CGU and no GS groups (1.57 ± 0.28 and 1.56 ± 0.20 , respectively; both *p* < 0.001) (Fig. 2).

The percentage of doctors with faculty positions was 58% in the GICMS-KB group, higher than 43% in the non-CGU and 38% in the no GS groups, with *p* value of 0.055 comparing the GICMS-KB with the no GS groups (Fig. 3).

Analysis of the six factors which hamper research activity showed that of the 30 of 45 doctors (66.7%) at GICMS-KB who responded to the questionnaire, 93.3% cited a lack of time for research, 76.7% a lack of research manpower, 66.7% inadequate research space and equipment, 50% a lack of

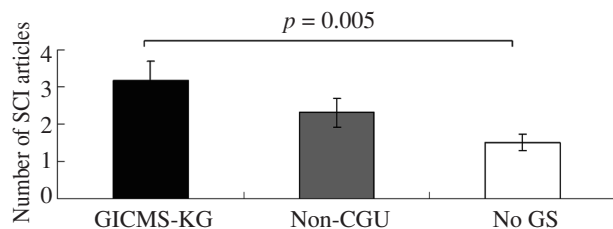


Fig. 1 Average number of SCI articles published as 1st author in five years in the three groups. Abbreviations used: GICMS-KB: graduate study at Graduate Institute of Clinical Medical Sciences- Kaohsiung Branch, Chang Gung University (CGU); Non-CGU: study abroad or at a domestic institute at other universities; No GS: no further graduate study.

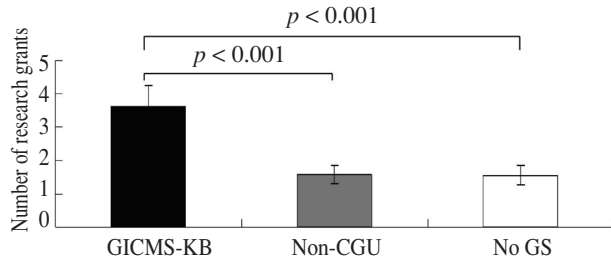


Fig. 2 Average number of research grants in five years in the three groups. Abbreviations used: GICMS-KB: graduate study at the Graduate Institute of Clinical Medical Sciences-Kaohsiung Branch, Chang Gung University (CGU); Non-CGU: study abroad or at a domestic institute at other universities; No GS: no further graduate study.

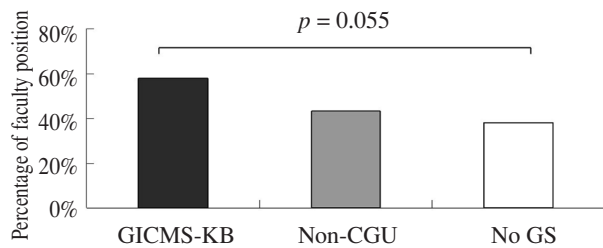


Fig. 3 The percentage of doctors with a faculty position in the three groups. Abbreviations used: GICMS-KB: graduate study at the Graduate Institute of Clinical Medical Sciences-Kaohsiung Branch, Chang Gung University (CGU); Non-CGU: study abroad or at a domestic institute at other universities; No GS: no further graduate study.

hospital administrative or department support, 20% a lack of family support, and 50% personal financial reasons. For those 54 out of 83 doctors (65.1%) in the non-CGU group who responded, 96.3% cited a lack of time for research, 83.3% a lack of research manpower, 70.4% inadequate research space and equipment, 42.6% a lack of hospital administrative or department support, 24.1% a lack of family support, and 35.2% personal financial reasons (Table 1). Both groups showed the same trends in the impact of the six factors that affect their research activity with lack of time being of prime importance in terms of interfering with their research. There was no significant difference in any of the six factors between groups.

The most frequently cited motivation for pursuing graduate study was “purely for research interest”

(13 out of 47, or 27.7%), followed by “for promotion” (10 out of 47, or 21.3%). “To become an academic physician or academic surgeon” ranked third in the questionnaire (9 out of 47, or 19.1%).

DISCUSSION

Several reports have evaluated the outcomes of graduate study. The Swiss national MD-PhD program, used publication activity, current positions and research activity as criteria.⁽⁶⁾ Kuo et al. determined that academic ranking, research project numbers,⁽¹⁾ and publications were crucial. We relied on numbers of peer-reviewed SCI papers, research grants, and faculty positions, which are typical means of evaluating graduate study outcomes.⁽⁷⁾ In 2007, an editorial in *Nature Medicine* stated “The international measure for the quality of research is the quality of the publications that result from it”.⁽⁸⁾

It seems that the publication of peer-reviewed SCI papers is currently the most non-biased criterion to evaluate the outcome of graduate study. From that perspective, our institute requests that each master’s degree student publish one SCI paper as the first author. Each Ph.D. student must publish at least two SCI papers as the first author that rank in the top 30% of his/her professional category to obtain a Ph.D. degree. These requirements are reflected in the results showing that the GICMS-KB group published significantly more SCI articles as the first author in five years than those who did not pursue further graduate education. It is not surprising that the former group has a higher percentage of faculty positions than the latter. Research training through advanced degrees enhances scholarly activity. Because of their strong publication record coupled with a solid foundation in science, graduates from GICMS-KB are attractive faculty candidates. The majority of graduates (58%) from GICMS-KB hold academic positions and rank, suggesting that they stay research-oriented. This is consistent with reports suggesting that MD-PhD graduates have more productive research careers than those without a Ph.D.^(6,9,10)

It is mandatory for every graduate student at GICMS, Chang Gung University College of Medicine, to write at least one research proposal and receive funding from CGMH-KMC. This research proposal training is reflected in those who have stud-

ied at GICMS-KB, in that they have significantly more research grants than those who have studied outside CGU and those with no graduate study or post-graduate training.

The mission of the GICMS, CGU, is to train doctors to become clinical investigators or physician scientists. Physician scientists provide an invaluable resource in the pursuit of clinically relevant basic and translational research discoveries.^(5,10-12) The common definition of a clinical investigator is an individual who obtains external funding for research.^(13,14) In this particular respect, we have achieved that goal.

It is interesting to find that physicians have the same problems affecting research activity, no matter where they studied. Kuo et al found that the biggest hindrance to medical research in Taiwan was lack of time for research,⁽¹⁾ which was cited by 74.3% of physicians in that study. In our survey we found that 93.3% to 96.3% of respondents to our questionnaire cited the same factor. Similarly, Kearney et al stated that lack of time and resources were the major disincentives to research for physicians who have their PhD.⁽⁴⁾ This phenomenon may be ascribed to financial or hospital pressure. Kuo et al found that most doctors spent 75% of their working hours in clinical care and 1~3 hours per week in the research office.⁽¹⁾ With little time for research and writing proposals for grant applications, those physician-scientists may become less competitive in their careers.⁽¹²⁾ Brand and Hannafin found that 95% of their respondents indicated that at least 30% of working time should be spent in research as physician-scientists.⁽¹⁴⁾

In this study, we found that the most frequently cited motivation for graduate study was “purely for research interest”, which was followed by “for promotion” and “to become an academic physician or academic surgeon”. The latter coincided with the reports by Straus et al and Fang et al, who showed that the incentive to complete a graduate degree (master’s or PhD) was the decision to enter academic medicine as an academic physician or academic surgeon.^(15,16) Goldacre et al found that the challenge of research was an incentive to academic medicine.⁽¹⁷⁾ Because of the limited sample size, the results of the questionnaire in this study are inevitably affected by sampling bias and thus further study is needed to support the conclusions.

Kuo et al found that 2% of the total physician manpower in Taiwan is composed of physician-sci-

entists.⁽¹⁾ The total physician-scientist manpower is estimated at 3% of the total physician pool in the U.S.A.⁽¹⁸⁾ At CGMH-KMC, around 2% of the total physician manpower is physician-scientists, of which 25% are graduates of GICMS-KB.

In summary, the academic performance of doctors who received postgraduate study at our graduate institute for clinical medicine is generally better than those without postgraduate studies or those who received postgraduate studies outside CGU. We ascribe this to the adaptation of doctors at GICMS-KB to our system and policies which include enforced grant writing and publication for graduation during the training course. In accordance with the above performance, two graduates from GICMS-KB have won International Guest Scholarships from the American College of Surgeons, the first two surgeons from Taiwan to receive that award. One graduate student won the Young Investigator Award of the National Science Council, also breaking the record of CGMH-KMC.

REFERENCES

1. Kuo KN, Hwang TL, Chen PJ. Physician-scientist: attitude of graduates of clinical medicine graduate schools. *J Formos Med Assoc* 2008;107:519-26.
2. Ferrer RL, Katerndahl DA. Predictors of short-term and long-term scholarly activity by academic faculty: a departmental case study. *Fam Med* 2002;34:455-61.
3. Gordon C, Salmon M. Postgraduate degrees for rheumatology trainees: an options appraisal of MD, PhD and MSc degrees. On behalf of the BSR Research and Training Committee. *Rheumatology* 1999;38:1290-3.
4. Kearney RA, Lee SY, Skakun EN, Tyrrell DL. The research productivity of Canadian physicians: how the timing of obtaining a PhD has an influence. *Acad Med* 2007;82:310-5.
5. Muslin AJ, Kornfeld S, Polonsky KS. The physician scientist training program in internal medicine at Washington University School of Medicine. *Acad Med* 2009;84:468-71.
6. Kuehnle K, Winkler DT, Meier-Abt PJ. Swiss national MD-PhD-program: an outcome analysis. *Swiss Med Wkly* 2009;139:540-6.
7. Dyrbye LN, Lindor KD, LaRusso NF, Cook DA. Research productivity of graduates from 3 physician-scientist training programs. *Am J Med* 2008;121:1107-13.
8. The long and short of it. *Nat Med* 2007;13:1265.
9. Dickler HB, Fang D, Heinig SJ, Johnson E, Korn D. New physician-investigators receiving National Institutes of

- Health research project grants: a historical perspective on the "endangered species". *JAMA* 2007;297:2496-501.
10. Ley TJ, Rosenberg LE. The physician-scientist career pipeline in 2005: build it, and they will come. *JAMA* 2005;294:1343-51.
 11. Donowitz M, Germino G, Cominelli F, Anderson JM. The attrition of young physician-scientists: problems and potential solutions. *Gastroenterology* 2007;132:477-80.
 12. Zemlo TR, Garrison HH, Partridge NC, Ley TJ. The physician-scientist: career issues and challenges at the year 2000. *FASEB J* 2000;14:221-30.
 13. Khanna N, Nesbitt L, Roghmann MC, Tacket C. Translation of clinical research into practice: defining the clinician scientist. *Fam Med* 2009;41:440-3.
 14. Brand RA, Hannafin JA. The environment of the successful clinician-scientist. *Clin Orthop Relat Res* 2006;449:67-71.
 15. Straus SE, Straus C, Tzanetos K. Career choice in academic medicine: systematic review. *J Gen Intern Med* 2006;21:1222-9.
 16. Fang D, Meyer RE. Effect of two Howard Hughes Medical Institute research training programs for medical students on the likelihood of pursuing research careers. *Acad Med* 2003;78:1271-80.
 17. Goldacre M, Stear S, Richards R, Sidebottom E. Junior doctors' views about careers in academic medicine. *Med Educ* 1999;33:318-26.
 18. Healy B. Innovators for the 21st century: will we face a crisis in biomedical-research brainpower? *N Engl J Med* 1988;319:1058-64.

醫學中心醫師進修成效之分析

蕭長春 周明慧 莊錦豪¹

背景： 鼓勵醫師進修為多數醫學中心的政策，但是進修的成效究竟如何，卻絕少有相關研究探討。

方法： 我們根據院內、外進修者以及未進修者，就院內登錄民國 92-96 年五年內三項學術指標表現，做一比較分析，並就院內、外進修者對影響研究相關因素是否有別，進一步深入探討。

結果： 長庚大學臨研所高雄分班進修者，五年內第一作者 SCI 論文數平均為 3.16 ± 0.52 篇，比未進修者 1.51 ± 0.22 篇顯著較高 ($p = 0.005$)，也比院外進修者 2.31 ± 0.39 篇高。長庚大學臨研所高雄分班進修者，五年內研究計劃件數平均 3.62 ± 0.64 件，比院外進修者 1.57 ± 0.28 件，未進修者 1.56 ± 0.20 件，均顯著較高 (p 值均 < 0.001)。長庚大學臨研所高雄分班進修者有講師級以上教職比率 58%，比院外進修者 43%，未進修者 38% 都較高。進一步從影響研究六個因素，比較它們對院內、外進修者之影響程度是否有別，發現兩者均同樣受這六個因素影響，之間並無差別。

結論： 長庚大學臨研所高雄分班進修者比未進修或院外進修者，五年內 SCI 論文數及研究計劃件數均較高，也因此有較高比率之教職。長庚大學臨研所高雄分班進修者較能適應醫院步調，且進修期間必須撰寫計劃及至少完成一篇第一作者原著論文，可能為造成組間差別之主因。
(長庚醫誌 2011;34:153-9)

關鍵詞： 臨床醫學研究所，醫師進修，論文，研究計劃，教職