

# Evolution of Pharmacy Education in Taiwan

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**Abstract:** Pharmacy education in Taiwan began in 1950s after the government moved from mainland China to Taiwan. It started with a 4-year university program. After a period of chaos from 1966 to 1999, all pharmacy education programs are 4 to 5 years at the university level after year 2000. These programs have to cover drug research and development, community pharmacy, hospital pharmacy and drug industry. Each year there are about 1000 pharmacy students graduated from 7 universities. Only 50% of them passed licensure examination per year. In 2006, 65% of licensed pharmacists were in practice. Among them, 28%, 28% and 23% respectively worked at hospitals, community pharmacies and private clinics. The remaining 20% worked in drug companies. National insurance program and failure to separate pharmacy from medical practice influence pharmacy practice tremendously.

A 2-year clinical pharmacy or hospital pharmacy master program with patient-oriented courses and advanced clinical experiential training was developed in 1993 at 2 national universities. Similar program has been developed in the other 3 universities with diverse contents. However, only 20 to 30 students nationwide may be admitted each year. In 2005, the 6-year pharmacy education program was widely discussed in a national pharmacy education conference. In addition, taking "ACPE guideline" as a model, the "white paper on pharmacy education in Taiwan" was developed through the efforts of all pharmacy faculties, some preceptors from teaching hospitals and councils of 2 pharmacy societies.

All pharmacy students in Taiwan have to fulfill practice-experience hours before graduation. Due to the advancement in hospital pharmacy practice since 1990s and the lack of prescriptions released to the community pharmacies, practice experience in hospital is emphasized. A joint committee formed by representatives from 2 pharmacy societies and the pharmacy union standardized the hospital pharmacy externship and preceptor training in 2005. Pharmacy licensure examination was reviewed by pharmacy faculties, and the proportion of pharmacy practice and pharmacotherapy will be increased from 20% to 40% in 2008. A 6-year pharmacy program concurrently with a traditional 4-year program in the National Taiwan University School of Pharmacy was approved by the Ministry of Education in June 2008, and will enroll new students in 2009. The reform of pharmacy education in Taiwan has a long-way to go. Future perspectives include expansion of pharmaceutical care in hospitals and community pharmacies, recruitment of experienced pharmacists as clinical faculties or clinical instructors, and implementing a standard pharmacy education program that meets the international standards.

**Key words:** pharmacy education, Taiwan, 6-years

## I. Background Information of Pharmacy Education in Taiwan

Before 1949, there was no pharmacy school in Taiwan. Pharmacists were trained in Japan. In 1949, National Defense Medical Center was moved from mainland China to Taiwan,

and trained pharmacists for military services. In 1953, the first school of pharmacy to nurture pharmacists to serve the public in Taiwan was implemented in National Taiwan University.<sup>1)</sup> Before 1966, 4-year university program was the only available program for pharmacy education. From 1966 to 1999 was the period of chaos in pharmacy education (Fig. 1). There had been 2 vocational schools that provided a 3- year program after

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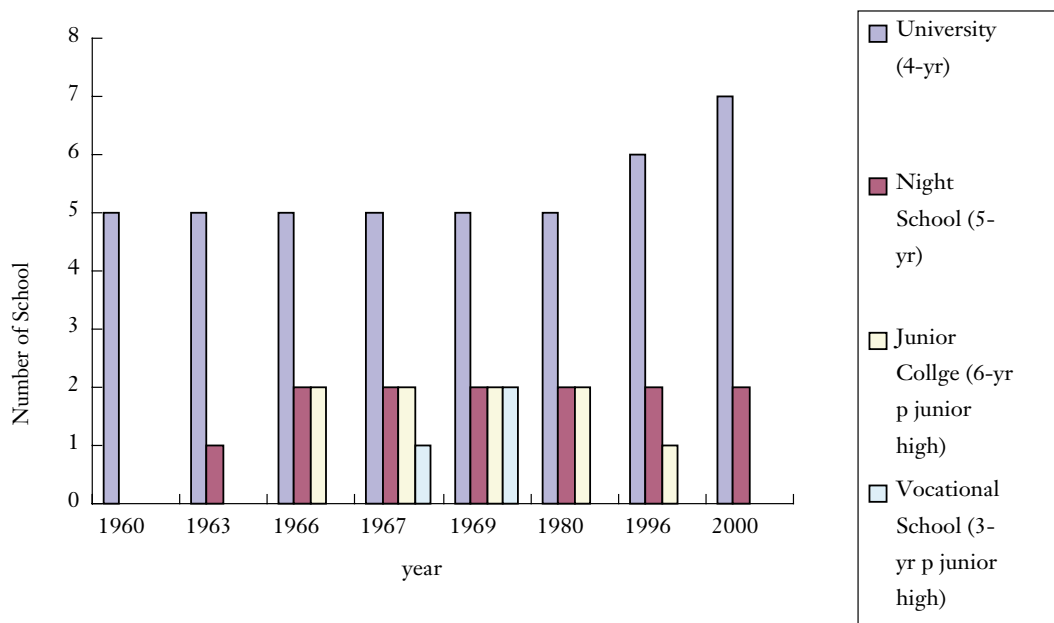


Fig. 1. History ofarmacy education in Taiwan

junior high school from 1967~1969. There were also 2 junior colleges that provided a 6-year program after junior high school. After up-grading these junior colleges, all pharmacy programs are 4 to 5 years at the university level after year 2000. Graduates from both university and junior college may take pharmacy licensure examination and become pharmacists, while those from vocational school became assistant pharmacists. Both pharmacist and assistant pharmacist can be the owner of a pharmacy, but only pharmacist is allowed to dispense narcotics, and to work in a hospital. Each year about 1000 pharmacy students graduate from 7 pharmacy schools in Taiwan. The licensure examination is held twice a year. The passing rate is 30% per examination, i.e., only 50% of them can get their license per year.

## II. Background Information of Pharmacy Practice in Taiwan

In 2006, only 65% of the licensed pharmacists in Taiwan were in practice (Table 1).<sup>2)</sup> Among them, 28.2%, 28.1% and 23.3% respectively worked at health institutes, community pharmacies and private clinics.<sup>2)</sup> The remaining 20% worked in drug companies, mainly drug dealers.<sup>2)</sup> From 1990 to 2006, hospitals in Taiwan decreased by 34%, while clinics increased by 58% (Fig. 2).<sup>2)</sup> Accordingly, the percentage of community pharmacist increased from 22.3% in 2001 to 28.1% in 2006.<sup>2)</sup>

Table 1. Comparison of pharmacists in Taiwan in 2001 and 2006

	2001	2006
Licensed	27,938	31,417
Not Registered	10929 (39.1%)	10995 (35.0%)
Registered	17009 (60.9%)	20416 (65.0%)
Registered		
Drug Company	4172 (24.5%)	4162 (20.4%)
Health Delivery System	12837 (75.5%)	16254 (79.6%)
Hospital	30.5%	28.2%
Community Pharmacy	22.3%	28.1%
Private Clinic	22.6%	23.3%

The most important issues that influence the pharmacy practice in Taiwan are “separation of pharmacy from medical practice” and “the health insurance policy”. The National Health Insurance (NHI) in Taiwan was started from 1995. A sunset clause of the law set year 1997 as the deadline to move pharmacies out of private clinics.<sup>3)</sup> Community pharmacies (including drug stores owned by assistant pharmacists) increased dramatically after 1995, but reach a plateau after failure of the separation (Fig. 3). In 2005, the Bureau of NHI tried not to cover over the counter (OTC) drugs, but did not succeed. Because the general public may access any medical institute without any restriction, the number of outpatient increases dramatically after implementation of NHI (Fig. 4). Compare with developed countries, the number of pharmacies or pharmacists in Taiwan is more than enough (Table 2 and Table 3). Despite the wide availability of community

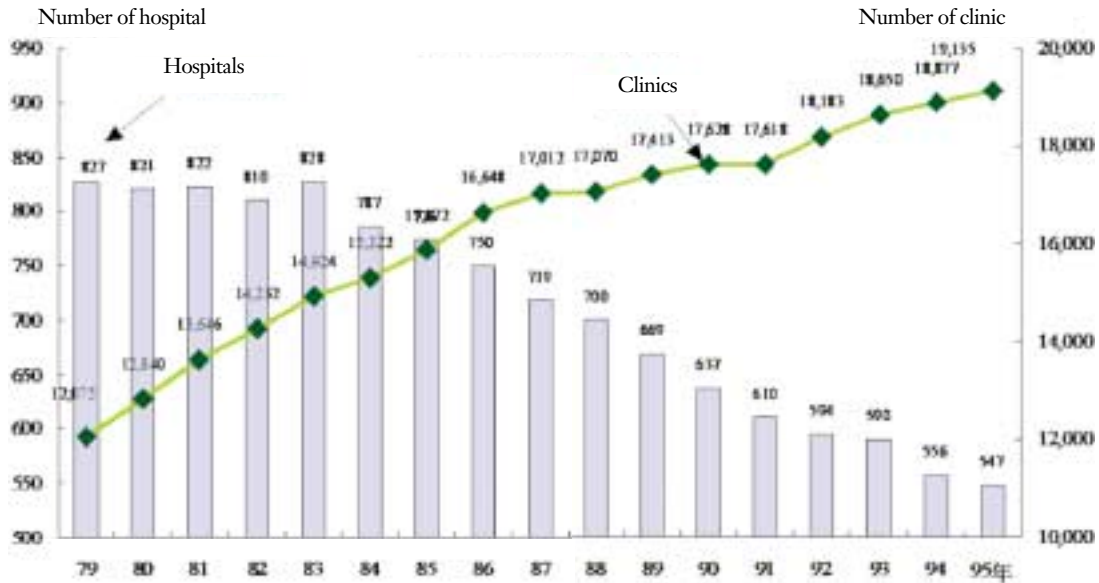


Fig. 2. Number of hospital and clinic in Taiwan from 1979 to 1995

From: Health and National Health Insurance Annual Statistic Services [Internet]. The Department of Health (Taiwan); [cited 2008 July 9]. Available from: <http://www.doh.gov.tw/statistic/index.htm>. with permission

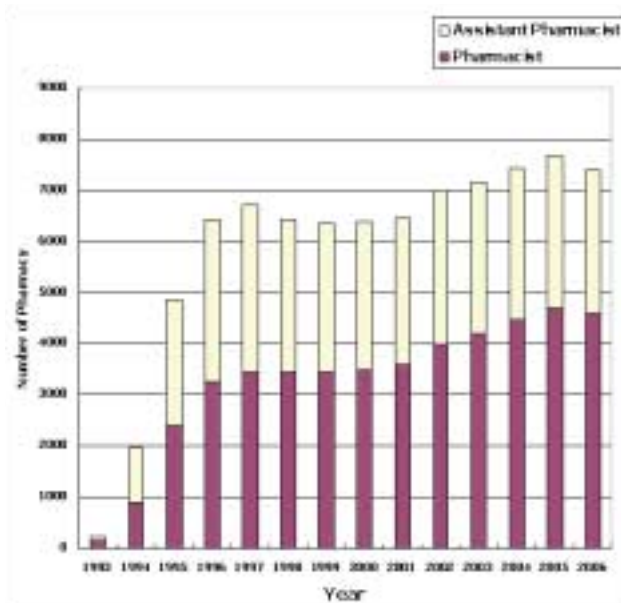


Fig. 3. Number of community pharmacy in Taiwan

pharmacies, minimal amount of prescriptions were filled in these pharmacies. From the reimbursement data of the Bureau of NHI, hospital pharmacies supply 70% of the prescription and nonprescription drugs and the in-house pharmacies in clinics supply the remaining 30%.<sup>3)</sup> The sales of OTC drug in Taiwan did not increase over years and the major income of community pharmacies came from health food and consumer products. Community pharmacists play very limited professional role.

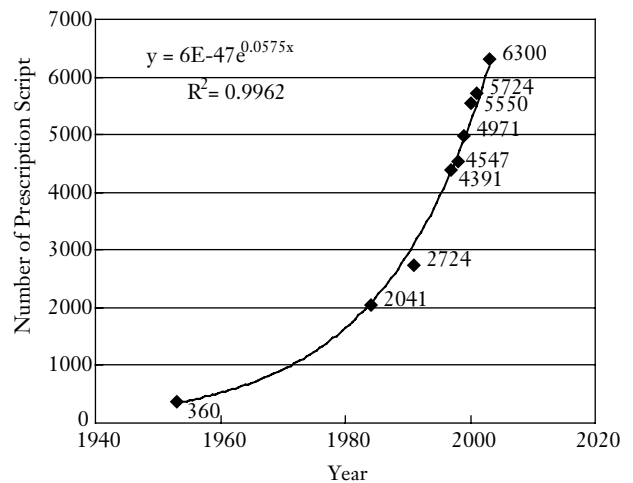


Fig. 4. Number of prescription in a medical center

On the other hand, pharmacy practice in hospital is well established. Taking the 2500-bed National Taiwan University Hospital as an example, there are 173 full-time pharmacists, 49 pharmacy aids, and 10 part-time pharmacists. The services provided include verification and filling of outpatient and inpatient prescriptions, cancer chemotherapeutic agent compounding, total parenteral nutrition compounding, patient drug counseling, drug information and analysis services, recommendation in drug therapy, drug therapy monitoring, pharmacokinetic monitoring, clinical trial drugs management, adverse drug reaction reporting, and medication data base management and mining.<sup>4)</sup> Thus hospital pharmacy is a very

**Table 2. Number of pharmacy and population served**

	Pharmacies (by pharmacist)	Drugstores (by assistant pharmacist)	Capita served per Pharmacies and drugstores
Taiwan (2006)	4,598	2,799	3,104
Australia	5,000	NA	3,600
France	22,377	NA	2,600
Germany	20,648	NA	3,900
UK	12,025	NA	4,800
USA	53,841*	NA	4,800

From GAO (US). Nonprescription drugs: value of a pharmacist-controlled class has yet to be demonstrated. 1995 p. 39. with modification

\*Includes drug chain, independent, food store, and mass merchant pharmacies.

**Table 3. Pharmacists and medical doctors in Taiwan during 2006**

Health professionals	Capita served per Health professional	MD to pharmacist ratio
MD	655	
Pharmacist	1121	1.7: 1
Pharmacist and assistant pharmacist	835	1.3: 1

good resource for pharmacy practice education.

### III. Evolution of Pharmacy Education in Taiwan

The missions of school of pharmacy in Taiwan are to foster competent pharmacists, to advance the pharmacy practice and its ability to serve the public and to contribute to research and development of drug.<sup>5)</sup> Pharmacy education has to cover drug research and development, drug industry, hospital pharmacy, and community pharmacy. In the four-year program, pharmacy practice related core courses include pharmacotherapy, drug information, biopharmaceutics, dispensing & clinical pharmacy, non-prescription drugs, pathophysiology, anatomy, microbiology and immunology, pharmacy law and ethics, and externship.<sup>5)</sup>

Since 1997, pharmacy students have to have at least 500 hours of pharmacy practice experience (externship) before graduation. Because of the well-development of hospital pharmacy, at least 300 hours of the practice experience have to spend in hospital pharmacy. The practice experience in community pharmacy or drug companies is elective.<sup>6)</sup> Through the joint effort of the Pharmaceutical Society of Taiwan and the Taiwan Society of Health-System Pharmacists, hospital pharmacy practice experience was extended to 640 hours since 2007.<sup>5)</sup> The contents of the hospital pharmacy practice experience were also standardized.

There are core courses and elective courses in the

standardized hospital pharmacy externship. The core courses include inpatient pharmacy, outpatient pharmacy, drug information services, clinical pharmacy services, and inventory control. The elective courses include cancer chemotherapy services, TPN compounding, and Chinese herb pharmacy (Table 4).

The Graduate Institute of Pharmacy in National Taiwan University initiated master program in 1970 and Ph. D. program in 1983.<sup>1)</sup> Students studying in these programs are major in Medicinal Chemistry, Pharmacognosy, or Pharmaceutics. In 1993, the first Graduate Institute of Clinical Pharmacy in Taiwan was established in National Cheng Kung University and a master of hospital pharmacy program was implemented in the Graduate Institute of Pharmacy of National Taiwan University at the same time.<sup>7)</sup> The later program became Graduate Institute of Clinical Pharmacy in 2000. Similar program has been developed in the other 3 universities with diverse contents afterwards. However, all these master programs only admit 5% of pharmacy students nationwide each year.

The mission of the graduated institute of clinical pharmacy is to nurture competent pharmacists and clinical pharmacy faculties. Three types of courses are in the curricula: didactic lecture or discussion, advance pharmacy practice experience (APPE) and thesis. In the 2 national graduate institute of clinical pharmacy, after 5-month intensive didactic lecture courses, students start the 9-month APPE. In the final 9 months of the master program, students focus on research.

The practice sites of APPE may include pharmacy administration, applied pharmacokinetics, intensive care unit, cardiovascular ward, family medicine ward, infectious disease ward, neurology ward, oncology ward, nephrology ward, pediatric ward, psychiatry ward, surgical ward, and transplantation drug therapy. Pharmacy department of the affiliated hospital works closely with the graduated institute of clinical pharmacy in this course. Preceptors for APPE include

**Table 4. Contents of standardized hospital pharmacy practice experience in Taiwan**

Core Course				
Inpatient Pharmacy (UDD since 1983)	Outpatient Pharmacy	Clinical Pharmacy Service (since 1991)	Drug Information Service (since 1960)	Inventory Control
Prescription evaluation (since 1960)	Prescription evaluation (since 1960)	Drug therapy evaluation	Drug information and analysis service	
Dispensing	Dispensing	Therapeutic drug monitoring	Clinical trial medication management	
Patient counseling	Patient counseling	Patient education	Pharmacy and therapeutic committee	
Recommendation on prescriptions	Recommendation on prescriptions	Recommendation on prescriptions	Medication use evaluation	
Extemporaneous compounding	Extemporaneous compounding	Adverse drug reaction monitoring and reporting Therapeutic conferences		
Elective Course				
Cancer Chemotherapy Service	TPN compounding (since 1983)	Chinese herb pharmacy		
Prescription evaluation	Nutritional status assessment	Prescription evaluation		
Aseptic dispensing and environmental maintenance	Aseptic dispensing and environmental maintenance	Dispensing		
Patient counseling	Patient counseling	Patient counseling		
Recommendation	Recommendation	Recommendation on prescriptions		
Incidence management	Filing	Extemporaneous compounding		

medical faculties, hospital pharmacists and clinical pharmacy faculties. Just like training a physician, experienced pharmacists are the best role models for these students. Progression of pharmacy department of the affiliated hospital is the cornerstone of clinical pharmacy education. Similarly, the development of pharmacy department will be impeded without the input of pharmacy school.<sup>7)</sup>

The theses for clinical pharmacy master program are mainly clinically-oriented, which include applied pharmacokinetics, therapeutics, pharmacy administration, pharmacoconomics, and pharmacoepidemiology, etc.<sup>7)</sup>

#### IV. 6-Year Program or not?

In the U.S.A., 6-year pharmacy education is mandatory since 2000, and only graduates from 5-year or 6-year pharmacy

education are allowed to take licensure examination after 2003. In Japan and Korea, 6-year pharmacy education is required by the government, and started from 2006 and 2008, respectively. In Thailand, 6-year pharmacy education is a consensus of all the pharmacy schools, and will become nationwide after 2009. In Taiwan, the issue is a dilemma and is still in debating.

Despite that the admission rate of graduate institute of clinical pharmacy is less than 11%, while the admission rate of the graduate institute of pharmacy is much higher when admission is limited to pharmacy students, there is no consensus on the mission of pharmacy board or that of pharmacy education. The arguments against 6-year program include low social status of pharmacists,<sup>8)</sup> requirement for pharmacists in different fields, and requirement of pharmacy students as graduate students.

Other problems in pharmacy education in Taiwan include: 1) variation in pharmacy education programs and qualities among

different schools; 2) pharmacy education program inadequate in preparing students with competencies for pharmacy practice and to serve the public; 3) inadequate pharmacy practice experiences in terms of time and contents; 4) pharmacy licensure examination not meet the requirement of selecting competent pharmacists; and 5) inadequate faculties in clinical related field and most being basic scientists without any practice experience. Six-year pharmacy program is quite a challenge in Taiwan.

### V. Reform of Pharmacy Education from 2004 to 2008

Despite all the difficulties, there were some progresses in pharmacy education from 2004 to 2008. Taking “American College of Pharmacy Education (ACPE) guideline 2000” as a model, the “white paper on pharmacy education in Taiwan 2005” was developed through the efforts of all pharmacy faculties, some preceptors from teaching hospitals and councils of 2 pharmacy societies in 2005.<sup>5)</sup> In the white paper, we concluded that Pharmacotherapy, APPE, pharmacoconomics, and pharmacoepidemiology are the major gaps between our pharmacy education program and the 6-year program.

A joint committee formed by representatives from 2

pharmacy societies and the pharmacy union standardized the hospital pharmacy externship and preceptor training in 2005. The contents, hours, and student evaluation form of hospital pharmacy externship were standardized. Training programs and accreditation procedures for preceptors were established. However, the reimbursement to the practice sites and the accreditation of practice-sites are still in debating.

There were also some progresses in the pharmacy licensure examination. Even though the members of the National Board of Pharmacy were exclusively faculties of pharmacy school who were mainly Ph.D., we tried to remind that the mission of the licensure examination was to protect the public, and tried to change the examination from product-oriented to more patient-oriented. Furthermore, the proportion of pharmacy practice (dispensing and clinical pharmacy) and pharmacotherapy examination increased from 20% to 40% since 2008.

A pilot 6-year Pharm D program was submitted by the National Taiwan University to the Ministry of Education in the early 2008, and got approval in June 2008. The program will enroll students from 2009. In the transitional stage, 6-year clinical pharmacy program will be parallel with a 4-year pharmacy program. Students will choose a program after 2 years of pre-pharm courses (Figure 5).

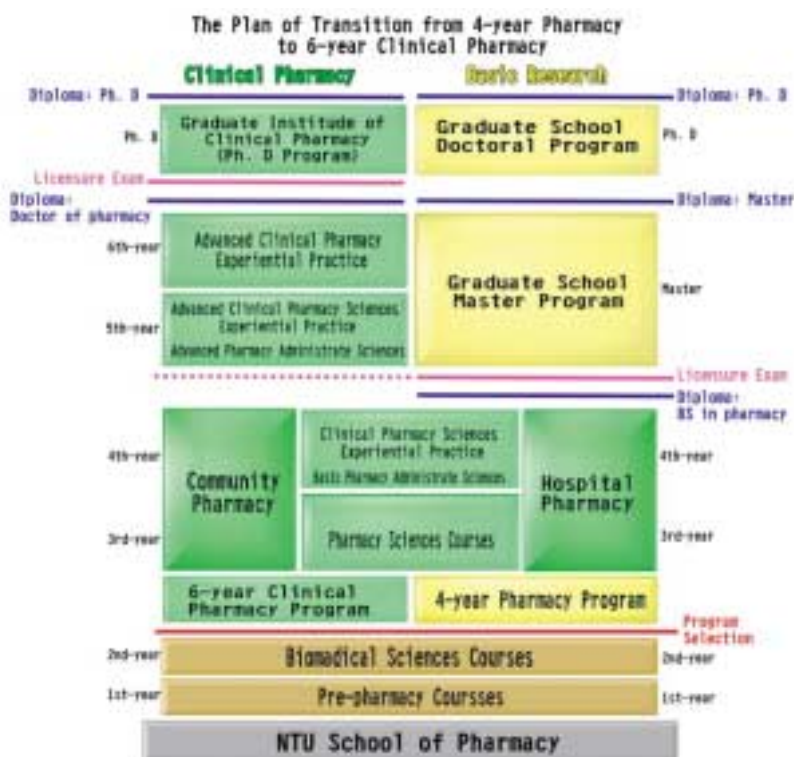


Fig. 5. The Plan of Transition from 4-year Pharmacy to 6-year Clinical Pharmacy

## VI. Future Perspectives

Education and health policies are two key factors for the future of pharmacists. The mission of pharmacy undergraduate program should focus on nurturing competent pharmacists. The mission of pharmacy graduate program should focus on the research and development in specific fields. In addition to setting a clear mission, we will implement a standard pharmacy education program that meets the international standards. The strategies for achieving the above goals include: 1) reform of pharmacy services; 2) implementing pioneer clinical pharmacy services by graduates with M.S. in clinical pharmacy; 3) extension of APPE sites; 4) international cooperation; and 5) international accreditation of pharmacy school. Meanwhile, we should increase the number and quality of clinical faculties by recruiting experienced or specialized clinical pharmacists and Pharm D graduates with residency or fellowship training. There should be different criteria for recruiting pharmaceutical scientists, clinical researchers and clinical faculties. There should be faculty development programs such as fellowship and Ph. D. program to advance the research ability of the clinical faculties.

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