

Master's program in clinical pharmacy at a Malaysian pharmacy school

AB FATAH AB RAHMAN AND MOHD BAIDI BAHARI

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In 1972, the Universiti Sains Malaysia (USM) School of Pharmaceutical Sciences was established with the main aim of meeting the demand for pharmacists in Malaysia. It was the first university in Malaysia to offer formal pharmacy education leading to a degree in pharmacy (B.Pharm.). The early curriculum was based on courses offered by British universities, with an emphasis on chemistry, compounding, and pharmacognosy.¹ In 1996, two more universities, the University of Malaya and the Universiti Kebangsaan Malaysia, started to offer pharmacy courses.² Pharmacy curricula offered at these universities are of four-year duration. Currently, there are eight pharmacy schools in the country, five of them offered by public universities and three by private universities or colleges. This article describes a master's program in clinical pharmacy offered by USM.

Health care in Malaysia. Malaysia (population, 23 million) heavily subsidizes its health care services. The Ministry of Health is the major health care provider in the country.

Secondary and tertiary medical care services are provided through a network of 121 hospitals and medical institutions.³ Outpatient care is provided at hospitals (specialty clinics and emergency departments) and at various health care facilities located in the community. The second major provider of health services is the private sector. Private health-sector financing is based on fee-for-service reimbursement and third-party payers who reimburse employees.⁴ There are about 225 licensed private hospitals, which are located mainly in urban areas.⁵ In addition, there are about 5000 private general practitioner clinics in the country.³

Pharmacy practice. Malaysia has two types of pharmacy practice, private and government. Private pharmacy practice is mainly represented

by chain-store pharmacies and independent pharmacies.⁶ Government pharmacy practice takes place mostly in government hospitals and health care facilities. Only about 18% of the more than 3000 registered pharmacists in the country work in the government sector.⁷ The distribution of private pharmacies varies widely among states. A recent study found that there are 23,451 inhabitants per private pharmacy.⁸ Because physicians have been given the legal right of dispensing under the Medical Act, private pharmacy practice is centered on the sale and supply of nonprescription products and products available only in pharmacies.⁹ As a result, many of these pharmacies are concentrated in big cities, where they cater to more affluent consumers.⁸

Clinical pharmacy education. In a continuing effort to advance, expand, and promote the practice of clinical pharmacy in Malaysia, the USM pharmacy school began adapting its curriculum to focus on the patient and on clinical practice.¹⁰ Many of these changes had been brought about by new faculty members returning from the United States with Pharm.D. degrees beginning in 1983. Curriculum changes were made thereafter; the proportion of clinical components increased. In 1990, the pharmacy school organized and held the First Pan-Pacific Asian Congress of Clinical Pharmacy; the

AB FATAH AB RAHMAN, PHARM.D., is Associate Professor and MOHD BAIDI BAHARI, PHARM.D., is Associate Professor and Head, Clinical Pharmacy Program, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia.

Address correspondence to Dr. Ab Rahman

at the School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia (fatah@usm.my).

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theme was "Clinical Pharmacy: Education and Practice." The congress was attended by many distinguished academicians and practitioners, including those from the United States, Japan, Australia, New Zealand, and Korea. Two years later, the pharmacy school started to offer the Master of Pharmacy Program in Clinical Pharmacy (M.Pharm.). The program is available to applicants with a B.Pharm. degree from USM or an equivalent degree in pharmacy from another recognized university. The M.Pharm. program seeks to prepare students with specialized knowledge and skills to assume roles in the provision of pharmaceutical care.

M.Pharm. curriculum and program. In the beginning, the M.Pharm. degree program was offered as a full-time program that students completed in one academic year. A part-time program was first introduced in the 1994–95 academic year. All new students register in May of each year, which is the beginning of a new academic year at USM. Students must accumulate 40 credits, 20 from didactic course work and another 20 from required and elective clerkships (1 credit unit = 12 contact hours).

The didactic course work comprises two- to four-credit courses in pathophysiology and therapeutics, clinical pharmacy practice, biostatistics, and pharmacokinetics. These courses are offered in four modules, each lasting about two weeks. Between modules, students have to complete one or two clerkships. The duration of each clerkship rotation is four weeks. Students choose the sites of clerkship from among USM University Hospital, Penang Hospital, and Seberang Jaya Hospital. Clerkship activities are aimed at equipping students with the ability to prevent or correct drug therapy problems by participating in the initiation and monitoring of therapy. Daily clinical drug monitoring allows students to interact and communicate with patients, peers, and other health practitioners.

Five pharmacotherapeutics courses are offered. Pharmacotherapeutics I covers the pathophysiologic and therapeutic aspects of cardiovascular and respiratory diseases. The main emphasis is on providing basic knowledge that will enable the student to understand the rationale for various therapeutic strategies. Pharmacotherapeutics II is a two-credit course on the pathophysiologic and therapeutic aspects of renal diseases. Topics include the management of acute and chronic renal failure, acid-base and electrolyte disorders, glomerular diseases, and drug-induced renal diseases. Dosing in renal disorders and dialysis therapy is also covered. Pharmacotherapeutics III is a four-credit course on the pathophysiologic and therapeutic aspects of gastrointestinal, endocrine, infectious, and arthritic disorders. Pharmacotherapeutics IV provides students with knowledge of common neurologic disorders and psychiatric illnesses. The main therapeutic drug classes studied are antiepileptic agents, antiparkinsonian agents, antipsychotic agents, antidepressants, and agents for headaches and migraine. Pharmacotherapeutics V is a two-credit course covering the pathophysiologic and therapeutic aspects of neoplastic diseases and common hematologic disorders. The course focuses on the clinical use of various antineoplastic agents, including agents for which pharmacokinetic monitoring is clinically useful.

In addition, a four-credit course deals with clinical pharmacy practice, and a two-credit course addresses biostatistics, study design, and pharmacokinetics. The clinical pharmacy practice course is designed to provide students with pharmaceutical care skills. The biostatistics, study design, and pharmacokinetics course is divided into two sections, the biostatistics and study design component, which introduces basic statistical concepts and methods, and the clinical pharmacokinetics component, which

teaches students about the application of pharmacokinetic principles in individualizing dosage regimens.

All courses are taught by clinical pharmacy faculty and physicians from USM University Hospital and Penang Hospital, who have been appointed as honorary lecturers. A final written examination accounts for 100% of the grade for each course.

Clerkships. Clerkships are offered during both semesters of the academic year. The honorary lecturers, pharmacy faculty members, and appointed hospital pharmacists are the preceptors for the respective clerkship rotations. The required clerkships are internal medicine, surgery, intensive care medicine, pediatrics, and infectious disease. In addition, students choose four elective clerkships from among the following: psychiatry, obstetrics and gynecology, drug information, total parenteral nutrition, therapeutic drug monitoring, community pharmacy practice, and hospital pharmacy practice.

During the clerkships, students participate in daily ward rounds with physicians and other team members. Students are assigned selected patients in the wards and are required to maintain current and accurate monitoring profiles for these patients. Students also participate in activities particular to each clerkship. During the infectious disease clerkship, for example, they spend time in the pathology laboratory learning about microbiological diagnostic procedures, and during the psychiatry clerkship, they help care for patients in clinics.

Pharmacy-based services are included in the elective clerkships. The drug information clerkship is intended to equip students with the skills necessary to identify drug information needs, conduct systematic literature searches, and evaluate the literature. Students communicate their responses to patients, peers, and other health practitioners either in person or by telephone. Students are required to spend part of this clerkship

rotation at Malaysia's National Poison Center, which is located on the university campus. The parenteral nutrition clerkship provides students with the ability to meet and monitor patients' nutritional needs. Students must also participate in the oncology pharmacy service during this clerkship. The clerkship rotation in therapeutic drug monitoring aims to equip students with the skills needed to individualize drug therapy by applying pharmacokinetic concepts and principles to dosage regimen design. Instead of the four elective clerkships, some students opt for an eight-credit elective consisting of a research project relating to drug therapy and pharmacy practice.

At the end of each clerkship, students present case reports to their classmates and the faculty. Case presentation accounts for 40% of the total clerkship grade, and the remaining 60% comes from continuous assessment by the pharmacy and medical preceptors.

M.Pharm. graduates. After a decade, the M.Pharm. program has produced 112 graduates. More than 40 of them were foreign students, mainly from less developed countries (Table 1). Most of the students learned of the program from friends who had graduated from the program or from the Internet.

Currently, most of our M.Pharm. graduates are working in a health care setting, such as hospitals (45 graduates, of whom 9 are part-time lecturers) and community pharmacies (5). About a quarter of the grad-

Table 1.

Graduates of Master's Program in Clinical Pharmacy

Graduation Year	No. from Malaysia	No. from Other Countries ^a
1993	10	3
1994	9	1
1995	2	2
1996	4	3
1997	8	5
1998	3	3
1999	4	5
2000	6	1
2001	7	3
2002	4	9
2003	9	11
Total	66	46

^aFrom Indonesia (19 graduates), Thailand (5), Libya (5), Pakistan (4), Yemen (3), Sudan (3), Jordan (2), Bangladesh (2), Saint Vincent and the Grenadines (1), Ghana (1), and Singapore (1).

uates chose to return to the academic environment as lecturers (23), and some continued their studies to earn a Ph.D. (20). The remainder (19) have another or an undetermined type of employment.

Conclusion. The master's program in clinical pharmacy at USM is designed to provide pharmacists with the knowledge and skills necessary to pursue clinical pharmacy activities and has attracted students not only from Malaysia but from other countries.

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