

Review of Evolving Trends in Clinical Pharmacy Curriculum around the Globe

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Abstract Pharmacy education in developing countries in the past, have mainly focused on industrial and product development roles of pharmacist. But these, major changes have been seen in pharmacy practice and other practice fields for pharmacists. The introduction of clinical pharmacy as a major discipline has necessitated a change in the current curriculum of pharmacy education in developing countries. The aim of this literature review is to summarize the research findings related to different clinical pharmacy curriculum being followed for training students in patient care areas among developed and developing countries including Pakistan. A total of 50 published articles were reviewed regarding current clinical pharmacy curriculum and clinical clerkship models which are followed worldwide. This review concluded that there is a need to upgrade the clinical pharmacy curriculum in the country so the pharmacist can be involved effectively in provision of direct patient care. The stakeholders should take strict actions to design an integrated clinical pharmacy model to be implemented in clinical clerkship for students. Therefore policy makers should accelerate legislative and regulatory changes to expand scope of clinical pharmacy practice in Pakistan.

Keywords: *clinical pharmacy, curriculum, developing countries, developed countries, Pakistan*

Cite This Article: Azhar Hussain, Madeeha Malik, and Saad Abdullah, "Review of Evolving Trends in Clinical Pharmacy Curriculum around the Globe." *American Journal of Pharmacological Sciences*, vol. 5, no. 1 (2017): 1-7. doi: 10.12691/ajps-5-1-1.

1. Introduction

Clinical pharmacy is a health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, and disease prevention. Clinical pharmacy is relatively a new approach in the pharmacy profession. Clinical pharmacy tends to focus more on the treatment of patients than solely on drugs, which aims to improve the quality use of drug therapy. The clinical pharmacists' activity is, therefore, patient oriented, cooperative, and inter-professional as they have to collaborate with physicians and nurses in the healthcare team [1]. The Philadelphia College of Pharmacy (PCP) North America was the first institute to come up with the idea of pharmacy educational program. The PCP started its first pharmacy professional course in 1821 i.e. the Bachelor of Pharmacy (B.Pharm), a two-year proficient course, which was later turned into four years program [2]. The second school, The Massachusetts College of Pharmacy was set up in 1823 and later the Department of Pharmacy was established at University of Michigan in late 1860s. In Europe, Manchester University was the first institute to start the degree in pharmaceutical sciences in 1904 [3]. In late 60s, the Clinical pharmacy was incorporated as a subject in the USA which prompts the period of clinical pharmacy in 1970s [4]. In 1990, the American Association of Colleges of Pharmacy (AACP) and Accreditation Council for

Pharmacy Education directed that doctor in pharmacy would be the new first-professional degree holder to practice in the United States of America [2].

The program of Pharm-D is the essence of the current practice based model as it evolved from industrial and compounding pharmacy to a more patient oriented program [5]. Clinical pharmacy field evolved out of the dissatisfaction with old practice standards and a dire need for the pharmacist to have extensive learning of pharmaco-therapeutics. The clinical pharmacy movement started at the University of Michigan in the mid-1960s [6]. The role of clinical pharmacist is not very well established, recognized and practiced in the developing countries [7]. A study from US suggests that the integration of clinical pharmacist in healthcare team has improved documentation of drug therapy and patient compliance [8]. In the US, the clinical pharmacist is an integral part of the patient's healthcare team which improves the patient care and as per tradition the pharmacists are performing clinical pharmacy services in hospital. Different barriers interfere in implementation of effective clinical pharmacy curriculum and clerkship in developing countries. The barriers include lack of facilities during the course of study, too old a curriculum, less number of clinical pharmacy and pharmacy practice courses and unavailability of qualified academicians [9]. Pharm-D syllabus is prepared by highly non-technical personnel with no clinical pharmacy or pharmacy practice background [10]. The syllabus is poor and incompetent to give clinical insight to graduates due to its limited contact to clinical setups and

patient care [11]. Regarding Pharm-D program in Pakistan there are deficiencies in the content of clinical curriculum, which should be noted and improved. Similarly, the Clinical Pharmacy practice and its curriculum in Pakistan and other developing countries are lacking experienced and qualified staff, non-existing role of pharmacist in direct patient care, teaching methodologies, and course content [12]. The situation in terms of clinical clerkship is not good because students are not satisfied regarding their clinical attachments [13]. In addition, in Pakistan, clinical clerkship lack academic and clinical training capacity in a number of institutions, shortage of established hospital pharmacy services, barriers in effective pharmacy practice, separate dispensing area and set of standard practice guidelines [14]. This current review focuses upon the current trends in pharmacy education, clinical pharmacy curriculum and clinical clerkship. The main objective of this review paper is to systematically identify the different clinical pharmacy curriculum being followed for training

students in patient care areas around the globe.

2. Methodology

The electronic databases from Pub Med, Google Scholar and direct Science were searched for articles published from January 2005 to June 2015. The search terms used with each database were clinical pharmacy, pharmacy curriculum, pharmacy practice and clinical clerkship. Full text papers as well as abstracts were retrieved and included in the review. A total of 50 studies were retrieved from databases related to pharmacy education. The studies were categorized on the basis of their country of publishing whether in developed countries, developing countries or Pakistan. Thirty studies from developed countries, 13 from developing countries and 7 studies from Pakistan were included in this review (Table 1).

Table 1. Detail of Country and Number of Included Papers

Regions	Number of studies	Countries
Developed countries	30	USA, Australia, UK, Japan, Germany, Switzerland, Canada, Denmark, Greece, Spain, Italy, Finland, Netherlands
Developing countries	13	Turkey, China, Ghana, Malaysia, India, Taiwan, Qatar, Jordan
Pakistan	7	-
Total		52

3. Results and Discussions

3.1. Role of Clinical Pharmacist in Patient Care

The role of clinical pharmacist is not very well established, recognized and practiced in the developing countries [15]. A study from US suggested that the integration of clinical pharmacist in healthcare team has improved documentation of drug therapy and patient compliance [16]. The clinical pharmacist in US is an integral part of the patient's healthcare team which improves the patient care and as per tradition they are performing clinical pharmacy services in hospitals [17]. A study in Australia revealed that pharmacy practice is heading in the direction of clinical pharmacy services provision [18]. Involvement of pharmacist in counseling and follow up is directly linked with lowering the rates of preventable adverse drugs events after hospitalization. Thus extended role of pharmacists in care of hospitalized patients should be made compulsory especially in medication reconciliation [19]. It has also been proved that pharmacists can contribute in safe and proper use of insulin in the inpatient setting by helping in reducing the chances of medication errors related to prescribing, transcription, dispensing, administration, storage, and communication [20]. A pharmacist demonstration study showed that they are helpful in dealing with chronic diseases like hypertension in line with the physician, thus reducing the blood pressure [21].

Role of pharmacist has positive impact on patient health outcomes. Pharmacists' clinical interventions by monitoring of ADRs, drug use evaluation, patient counseling, drug management, participation in medical

rounds and maintaining patient profile confirmed a decrease in patients mortality rate [22]. In United Kingdom, clinical pharmacy services are provided at pharmacies during the dispensing process and at nursing homes [23]. In Jordan it has been shown that 69.4 percent physicians accept the clinical pharmacists as their healthcare ally. The increase in number of clinical pharmacists and their services has lead to lesser drug interactions, better quality of life and therapy for the patients [24]. In Nepal, clinical pharmacists are performing health activities like patient counseling, patient education, drug information and pharmacovigilance as a results of changes in Pharmacy curriculum and training of pharmacist [25].

3.2. Overview of Pharmacy Education in Developed Countries

In 20th Century introduction of Pharm-D programs enhanced the role of pharmacists in the provision of healthcare. In developed countries, the Pharm-D has not only increased the diversity in curriculum but has also made it possible for the pharmacists to contribute towards direct patient care [26]. In Canada, the pharmacy education is based on strong foundation of research because the public sector universities have good funding. The development of pharmacy education and practice in Canada has set the basis for a range of promising trends related to extended roles for pharmacists [27]. France prepares its pharmacists in 6 years a step initiated after health reforms in 1984, which had grabbed attention towards pharmacy professionals. In France, specialization in hospital pharmacy needs internship training. However, the main focus in specialization is still community

pharmacy [28]. In the United Kingdom, duration of pharmacy education degree program is four years, which is the shortest among the European countries' pharmacy programs. Pharmacy education in the UK will face challenges in coming years due to easy approach of getting admission in Master of pharmacy program [29]. In Australia, the principal pharmacy degree is four year bachelor of pharmacy program. However, some universities offer master of pharmacy degree in six semesters over a period of two years. Curriculum includes applied pharmaceutical science, pharmacy practice, clinical, and experiential teaching guided by competency standards and an indicative curriculum. For Australian pharmacy graduates, clerkship of 12 months is compulsory after graduation before competency based registration [30].

3.3. Overview of Clinical Pharmacy Curriculum in Developed Countries

On the demand of clinical pharmacists in the developed countries additional courses of clinical pharmacy are being added in the pharmacy curriculum. Thus, the United States of America, China, Australia and other countries started clinical pharmacy courses [26]. Developed countries designed a diverse curriculum of Pharm-D program in a way so that integration of clinical pharmacists in direct patient care must be assured [4]. Pharm-D program should be designed in such a way that the pharmacists is trained in the provision of pharmaceutical care services instead of just a medicine provider. A study conducted in Norway highlighted that there is a need to update clinical pharmacy curriculum by increasing in the number of excelling candidates for academic position in clinical pharmacy. Demand has also been seen for the clinical pharmacists in the field of research and practice. The study has emphasized that by imparting problem solving skills through group work and the use of real patient case studies are considered and preferred approaches in clinical pharmacy learning [31].

3.4. Overview of Pharmacy Education in Developing Countries

Looking at the global trends, many developing countries have extended their Pharm-D pharmacy program to 5 and 6 years. However, there is a need to assess whether these countries are really interested in a patient care oriented model or just enrolling their students in the US framework [9]. A huge change has been observed in Thai pharmacy education when the Pharmacy Council declared that all schools must offer a 6 years program by the year 2014. Thus sixth year program was made compulsory for clinical clerkships [32]. The same is in the case of Korea, where the pharmacy course duration was extended to 6 years and the curriculum was more clinically orientated. But introducing doctor of pharmacy degree is expected to increase the struggle for power between pharmacists and physicians [33]. In China, the case is different as majority of pharmacy programs are product oriented. Hence, their pharmacy education is focusing on chemistry, pharmaceuticals, and the control and regulation of drug products delivery systems [34]. Now their focus is more on patient oriented education as they establish separate bachelor of clinical

pharmacy discipline [35]. In Sri Lanka, still B-Pharm degree program is offered at pharmacy institutions. Yet, there is no postgraduate program offered by any local university in pharmacy [36]. India introduced Pharm-D course for the first time in their country in 2007. The pharmacy education is keenly observed by Pharmacy Council but still lacks a proper system to improve curriculum and develop pharmacy setup. The reason for this failure regarding pharmacy education both in bachelor and masters levels is high influence of pharmaceutical industries [37].

A continuous progress in Pharmacy education and practice has been observed in Middle Eastern countries [9]. In order to achieve the desired number of graduates in Saudi Arabia, several new programs were launched. For meeting the needs of advanced practice, a Pharm-D degree is now offered in most of the pharmacy institutions. Most of pharmacy schools offer one year internship after the completion of degree. The evaluation process is based on short assays, multiple-choice questions, and laboratory assessment along with research projects in some schools [38]. In Iraq, pharmacy school issues a bachelor degree of pharmacy after 5 years of study. The public schools also offer high diploma, M.Sc., and Ph.D. programs in all fields of pharmaceutical sciences. Pharm-D program has not been started in Iraqi pharmacy schools [39]. The Pharmacy institutions in Jordan issues pharmacy degree, which needs completion of 165 credit hours to get a bachelor degree in pharmaceutical sciences. However, less attention is paid towards the education programs and lack of patients-oriented jobs are major problems in Jordan [24].

In Qatar, the pharmacy is in its juvenile phase, and in 2008, one college obtained accreditation from the Canadian Council on Accreditation of Pharmacy Programs. It's the only pharmacy program that has been accredited by Canadian council outside Canada. The Pharm. D degree of Qatar was intended to meet Western accreditation standards and provide advanced professional training opportunities for students wishing to pursue specialized clinical careers [40]. In West bank of Palestine, four pharmacy schools are offering 5 years bachelor of science (B.Sc.) program, which requires the completion of at least 10 full semesters and clerkship at community pharmacies, hospitals, or industry. Only one University has B.Sc. in pharmacy and Pharm-D programs [41]. In Yemen, the curriculum of pharmaceutical sciences is developed to provide pharmacy students with all the knowledge on both essential and pharmaceutical sciences to help them in the field of pharmacy. Yemen universities offer both bachelor of pharmacy and doctor of pharmacy (Pharm-D) programs. The duration of a bachelor degree program in all public and private colleges is 5 years. There are many problems in pharmacy education such as lack of facilities during the study, old curriculum, less number of clinical pharmacy and pharmacy practice courses. There is no clerkship of clinical pharmacy offered and non-availability of qualified academicians are also the basic issues in the private institutions [5].

Recently, drastic changes have been made to improve the Egyptian pharmacy curriculum of the bachelor degree of pharmaceutical sciences (B.Pharm) degree, which is a 5 years education program. The Egyptian pharmacy program

has basic, pharmaceutical, medical, social, behavioral, management, health, and environmental sciences and pharmacy practice [42]. In Sudan, the undergraduate curriculum follows the traditional full academic year system. The total number of hours for the bachelor of pharmacy degree (BPharm) is 3960 hours (4 years) and consists of 1680 hours of theory (42.4%) and 2280 hours of experiential work. Additionally, students have 200 hours of training at a community or a hospital pharmacy after the second and third years, and 200 hours of pharmaceutical industry training at the end of the fourth year [43,44]. In Nigeria, pharmacy education has undergone through evolutionary changes i.e. from science based curriculum to a more practice based curriculum. The faculties of pharmacy offer a 5 years Pharm-D degree program. The content of pharmacy curriculum varies across the institutions, but most of them use traditional curriculum of pharmaceuticals, pharmacognosy, medicinal chemistry, pharmacology, with clinical pharmacy and practice [45].

3.5. Overview of Clinical Pharmacy Curriculum in Developing Countries

Clinical pharmacy is the branch of pharmacy, where pharmacists provide patient care which optimizes use of medication and promotes health, wellness and prevention of diseases. Advancements in the field of pharmaceutical sciences and progressing role of pharmacists in direct patient care are compelling pharmacy institutions to come up with new courses and modules which can equip the future pharmacists with the updated knowledge in order to enhance their skills for better patient care [9]. A Pharm-D program must have a curriculum including multidisciplinary courses, so that the students can distinguish their role as pharmaceutical care providers instead of simple being a drug dispenser. There is a rise in clinical pharmacy popularity in many developing countries which has extended their pharmacy curriculum to a 5 or 6 years Pharm-D program. However, there is a need to assess either these countries are really keen in patient oriented training or just want their graduates to be enrolled in the US framework with this enhanced model [46].

Following the trend, interestingly, institutions in the countries like Saudi Arabia, Jordan, and Kuwait started 5-6 years clinical oriented Pharm-D degree courses [24]. In Egypt, courses of clinical pharmacy are started at undergraduate level and specialization in clinical pharmacy is introduced at masters level [42]. In India 6 years Pharm-D was started in 2008 as professional degree of pharmaceutical sciences. The curriculum is mainly focusing on clinical and community aspects of the profession with compulsory practical training at hospitals and community pharmacies. The studies show that Pharm-D in India is designed by highly non-technical persons who had no idea about clinical pharmacy or pharmacy practice [47]. In Iran pharmacy curriculum has been updated but clinical part is still not much developed as students have limited exposure to clinical setup [23]. The situation is much better in Gulf countries where development of clinical aspects of Pharm-D curriculum were undertaken in the direct supervision of experts from developed countries which contributed in starting the

clinical oriented Pharm-D program [48]. A study from Indonesia indicated that pharmacists' knowledge of clinical pharmacy practice was not up to the mark, which could be enhanced through proper clinical pharmacy education [49]. A study conducted in Philippines concluded that clinical pharmacy curriculum requires improvement for enhancing the performance of graduate's patient care. Same is the case in China, where a study stated that program of clinical pharmacy should focus on patient oriented education and need was highlighted for practice based curriculum for all institutions of pharmacy [49]. A study from Tanzania concluded that newly introduced clinical curriculum should be monitored for future improvements in the practice of pharmacists [50]. It should also be practiced during the development and updating of curriculum. Some elements are often missed due to the negligence at time of development of curriculum and in this case is mainly observed in South Asian and Southeast Asian countries where Pharm-D programs are still in the developing phase [9].

3.6. Overview of Pharmacy Education in Pakistan

In Pakistan, the University of Punjab took the initiative for introducing a three year bachelor program in 1948; which was later upgraded to four years degree program in 1978-1979. The pharmacy education remained unattended until Pharmacy Council of Pakistan was established in 1967. It is a professional body responsible for regulating the registration of pharmacists and promotion of pharmacy education in Pakistan. In 2003, the Higher education Commission (HEC) updated its B-Pharm program to a five years degree program, that is, Doctor of Pharmacy (Pharm-D). In this program, aspects of clinical pharmacy were added to the course-work and clinical clerkships were also included as integral part of the curriculum [51].

In the last decade, pharmacy profession has seen vibrant changes in policy and education in Pakistan. Introduction of the Pharm-D program and then the recognition of pharmacy practice as fifth pillar in pharmacy education along with the practice have increased the acceptability of pharmacy graduates in Pakistan and abroad. Today, seventeen public sector universities and seventeen private sector universities are authorized to offer Pharm-D program and 28 institutions have recently received No Objection Certificate (NOC) in this regard. In Pakistan, both annual and semester systems are available in which the latter is more common. All Pakistani pharmacy institutions (universities or colleges) are required to follow the Higher Education Commission (HEC) approved Pharm-D syllabus; which is the essential requirement for accreditation from Pharmacy Council of Pakistan [46].

3.7. Current Trends in Clinical Pharmacy Practice in Pakistan

In the developing countries, clinical pharmacy is in its developing stage, especially in the most populated countries such as India and Pakistan, where health facilities are not up to the mark and prevalence of chronic diseases is increasing every day. In these situations,

services of clinical pharmacy can give a considerable advantage to a number of patients. In developing countries, it is the responsibility of authorities of professional pharmacists to make an alliance for addressing the issues related to standardization of practice of clinical pharmacy. In Pakistan clinical pharmacy is still in its juvenile phase, therefore, participation of pharmacists in direct patient care is not remarkable [52]. Likewise, there are a limited number of hospitals, where clinical pharmacists are employed with their active role in direct patient care. However, in public sector, new jobs are being created but are mainly related to traditional role of dispensing medication and development of hospital formulary. In Pakistan, several universities have signed Memorandum of Understanding (MOU) with foreign universities to formulate an environment to address the deficiencies through shared knowledge, clinical skills and updates in clinical pharmacy. One of the important challenges faced by pharmacists is in the provision of hospital jobs and their recognition in clinical setup by the medical and paramedical persons. The studies highlighted that prevalence of drug related problems (DRPs) are less, however, a few studies were conducted in Pakistani hospitals regarding these problems. The studies confirmed presence of DRPs and verified positive impact of pharmacist intervention on reducing drug related problems and in direct patient care [53].

A study conducted in a hospital of Karachi concluded that clinical pharmacists have a basic role in activities of hospital and can participate in the development of quality of medication use and safety of patients. Moreover, the study also describes the recognition of clinical pharmacist intervention as prescriber and confirmed that clinical pharmacist can positively participate in identifying and resolving the drug related problem in healthcare setting of Pakistan [54]. According to another study conducted in a tertiary care hospital in Karachi reports that about 4134 medication errors were made with the rate of 0.7% in 2003. In the same hospital, medication errors were increased to 6061 with a rate of 0.98% in 2004. These medication errors were identified and prevented by the pharmacists before occurrence. These statistics are considered to be low on the assumptions that many of the other medication errors remained unidentified, thus proving the need for clinical pharmacists in direct care of patients [9].

3.8. Current Clinical Pharmacy Curriculum in Pakistan

Around the globe, there is an increased trend towards Doctor of Pharmacy (Pharm-D) degree, including Pakistan. Shifting towards more clinical oriented programs is due to many factors, such as, conditions that require intensive care and therapies, increase in the antibiotic resistance and the highly increasing geriatric population etc. In 2005, the Pakistan Pharmacy Council upgraded the B.Pharm program to a 5 years Pharm-D program including academic study and clerkships. Regular improvement in the pharmaceutical sciences and emerging role of pharmacists in pharmacotherapy are forcing the schools of pharmacy to design new programs and courses to prepare the future pharmacists with updated knowledge and skills in the direct patient

care and management. The concept of pharmacy practice experience is rare in Pakistani curriculum [55]. A study highlighted that situation of Pakistan is not the best because of the reason that clinical pharmacy is still in its juvenile phase. Therefore, participation of pharmacist in direct patient care is not remarkable and this is also considered as the main reason of less clinical component in the doctor of pharmacy syllabus. Pharm. D syllabus offers partial didactic and practical contact with shortage in the content of the curriculum, difference in pattern of examination, lack of synchronization between course content and learning objectives, lack of expert consultation, prevalence of misconceptions among health professionals and an absence of the regulatory framework. Major drawback in the clinical pharmacy practice of Pakistan is shortage of practiced and qualified staff that the pharmaceutical education sector is facing after up gradation of B.Pharm program to a Pharm-D program. This is one of the main reasons for the deficiencies in the clinical contents of the Pharm-D program [9]. For the survival of clinical pharmacy and its development, it is mandatory to get acknowledgment from the healthcare team and general community as a whole. Moreover, major focus should be given on designing, expanding, and diverse clinical pharmacy programs. This can be done by updating curriculum through more practice based education, ideal pharmacy setup, enhancing more clinical skills and clinical based intervention during the ward rounds. These are some of the recommendations that can enable pharmacy educators in Pakistan to produce ideal pharmacists that can provide direct patient care. The recommendations for pharmacy academicians could be helpful in establishing a pharmacy setup to prepare future pharmacists that can participate in direct patient care: Training and practical skills based Pharm-D curriculum, launching ideal pharmacy practice setups, applying the practical experience gained in academic settings by interning in existing clinical initiatives, employing clinical care based interventions during ward rounds, emphasizing on problem based learning and pharmacy curriculum development and validation model [51].

3.9. Introduction of Clinical Clerkship in Pakistan

In Pakistan, clinical pharmacy clerkship completion is required for doctor of pharmacy degree program. But in curriculum, there is no organized plan to conduct this clinical clerkship and there is less practical work of pharmacy practice courses mentioned in the curriculum, which is 3.03 percent of the total course only. So, in clinical programs, clerkships are integral part for proper evaluation and training of students. In Pakistani hospitals, the main focus of clinical clerkships is the recording of patient histories, with special emphasis on medication histories. Clinical clerkship should communicate adequate clinical skills to the trainees and therefore it is suggested to be evaluate clinical skills separately from pharmacy course work [35]. Another study of Karachi while highlighting the issues of clinical clerkship concluded that lack of academic and clinical training capacity has been observed in many institutions, shortage of established hospital pharmacy services in the country, barriers to

effective pharmacy practice, lack of dispensing separation, and lack of standard practice guidelines [51].

In Pakistan, this situation is questionable, as many pharmacy colleges exist without an attached healthcare facility, where students can complete clinical clerkship. In order to avoid this issue, it has been concluded that existing pharmacy clinical clerkships in hospitals, after the completion of doctor of pharmacy degree, must be expanded from six months to one year. After the completion of final year, for Pharm-D graduates, there must be extensive clerkships in the hospitals to enhance their clinical skills, so that pharmacists can participate in modern era of practice as healthcare members and to serve community [51]. Drug related problems are extensively affecting the existing healthcare system in Pakistan. The availability of qualified pharmacists in each unit of every hospital is necessary to address the issues related to use of medicines. Effective clinical pharmacy clerkship program can play a key part in setting direction for clinical pharmacy in Pakistan. The involvement of Pharm-D graduates' as team members of healthcare professional can promote proper drug utilization in health care settings [51,52,53,54,55].

4. Conclusion

This review paper concluded that clinical pharmacy curriculum is well designed and implemented in developed countries. However, clinical pharmacy practice curriculum is not well designed in terms content and not well perceived in developing countries including Pakistan. There is lack of experienced and qualified staff, lack of involvement of pharmacist in direct patient care and use of conventional teaching methodologies. Thus, there is a dire need of designing and adaptation of a standardized curriculum in harmony with the international standard that can promote good pharmacy practice in developing countries including Pakistan. The current clinical pharmacy curriculum must be upgraded so that pharmacist can be involved effectively in provision of direct patient care in these countries. The policy makers should accelerate legislative and regulatory changes to expand scope of clinical pharmacy practice in developing countries as well as in Pakistan.

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