

Pharmacy Education in Selected Countries from the Western Pacific Region: Status Quo and Moving Ahead

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Abstract:- The pharmacy profession is dependent on the nation's pharmacy education. How the professional practices and roles are carried out and made available for the graduates are influenced by the education which equips them with knowledge, skills, and attitude to be workplace ready. However, pharmacy education is also shaped by the professional practices and roles. The workplaces can shape education in terms of indicating demands for jobs and positions. As the roles of professional practice is governed by the health care needs of a country, pharmacy education can vary from nation to nation. The International Pharmaceutical Federation has issued a document calling on schools of pharmacy to craft a program that is responsive to the health care needs of its country. The Western Pacific Region is an interesting mix of developed and developing nations with differences in health care system, health care needs, and resources. Collaboration and learning opportunities to share best practices is possible in this region to further augment the education practices to improve professional pharmacy practice in each other's countries.

Keywords:- Pharmacy Curriculum, Pharmacy Education, Western Pacific Region.

I. INTRODUCTION

The World Health Organization reports that the health systems will only function with health care workers. By 2030, the low- and lower-middle income countries mostly, will need about 18 million health workers [1]. As of March 10, 2022, there are 4.42 pharmacists per 10,000 population in the Western Pacific Region [2]. In a 2017 document by the International Pharmaceutical Federation (FIP), it mentioned about services that community and hospital pharmacies provide. Community pharmacies may offer services for improving the use of medicines, product-focused services, primary care and public health services, and other advanced services such as home care, repeat dispensing, adjusting prescribed treatment. Hospital pharmacies have provided influence on procurement and prescribing, preparation and delivery of medicines, monitoring of medicine use, and other activities and services such as support to emergency departments, antibiotic stewardship, managing medicine-related waste, and clinical trials [3]. In the advent of these roles, it becomes imperative that pharmacy education should

evolve to provide pharmacists equipped and competent for such roles. The 2013 FIPed Global Education Report of articulated the need to link pharmacy education with health needs and national priorities. In order to fulfill such, there must be a collaboration with key partners such as government and national and international pharmacy organizations. To address the global shortage of pharmacist academics and practice-based supervisors, universities and lawmakers need to create clear career tracks and trainings to address this need [4]. This review is of interest since the region is composed of developed and developing countries with various resources, technology, and population. It would be interesting to recognize common trends in the pharmacy education and present existing pharmacy educational landscape that will allow each country to acquire perspectives of the other, stimulate collaboration or development. In addition, this review aims to let countries see the possibility of forming a formal cooperation to allow for harmonization of pharmacy education for mutual recognition of pharmacy degrees and reciprocity of professional practice.

II. PHARMACY PROGRAMS IN SELECTED COUNTRIES

This review retrieved published articles on the subject of pharmacy education from countries in the Western Pacific Region. The search generated usable articles from American Journal of Pharmaceutical Education, Journal of Asian Association of Schools of Pharmacy, International Journal of Medical Education, and FIP's Pharmacy Education. The published resources from FIP were also included as they provided insights on initiatives in pharmacy education.

A. Australia

Admission. Most of the students apply directly from secondary school but some transfer from other tertiary programs. The results of the final years of secondary school are important basis for acceptance. The country has a unified year-12 secondary school program and the students complete centrally administered assessment tasks, and the students are ranked against one another using a complicated system to maintain equity. The students apply for all university programs through a central agency from which the faculties of each university can select from. The scores from Undergraduate Medicine and Allied Health Admission Test (UMAT) or Special Tertiary Admissions Test (STAT) may

be considered for entry into some schools. Selection is based on high levels of achievement in the areas of chemistry, mathematics, and English in year-12 of secondary school. International students may also be admitted, mostly having partial degree in another science-based discipline or has a completed degree in another discipline. Students who have completed a relevant undergraduate degree are eligible to apply to a postgraduate program which will meet the educational requirements for pharmacist training. Such programs are open to graduates who have completed prerequisite subjects such as human biology, chemistry, biochemistry, microbiology, anatomy, and physiology within the last 10 years, with a record of high academic performance. Additional requirements may include a 500-word letter of application and referee reports from individuals who can attest to the communication skills and application of ethical principles as required of a health professional. An interview may also be required. Applications are ranked and entry is competitive. A big pharmacy school such as Monash University admits about 200 freshmen per intake while newer and smaller schools may admit less [5].

Pharmacy Degrees Available. BPharm is 4 years, MPharm is 2 years; both would have to fulfill one year of internship in a practice setting before applying for registration. The Graduate Certificate, Graduate Diploma, Master of Clinical Pharmacy, and Doctor of Pharmacy were created with the intention to train pharmacists for clinical roles. These post graduate programs are designed for pharmacists working full time in a clinical setting and usually offered as part-time, off campus distance learning with optional face-to-face weekends for in-depth practical application. A pharmacist can start with the Graduate Certificate then progress to the Graduate Diploma and Master of Clinical Pharmacy. The Doctor of Pharmacy program is designed to equip the graduates to conduct pharmacy practice research [6].

Program Accreditation. The programs offered must be accredited to ensure that the graduates meet the required professional practice and education standard set by the government and the professional societies. The Australian Pharmacy Council (APC) accredits pharmacy programs and the Pharmacy Board of Australia approves these programs (Australian Accredited Pharmacy Degree Programs', n.d.). APC is the national accreditation authority for pharmacy education and training. Other organizations involved are The Australian Qualifications Framework Council, and the Tertiary Education Quality and Standards Agency (TEQSA) [7].

B. Brunei

Admission. To be eligible for the program, the applicant must have Grade C6 in English Language at GCE 'O' Level Examination or Grade 'B' in IGCSE English (as a Second Language) or IELTS overall score of minimum 6.0 or better, or any other equivalent. For applicants from a local high school curriculum, a minimum of 300 points for three (3) 'A' Level passes in relevant Science subjects with a minimum of Grade B for Chemistry and a minimum Grade C in at least two other Science subjects (Physics, Mathematics or Biology) or if applying with an International Baccalaureate

program, a minimum score of 32 points including a minimum of 5, 5, 5 points in relevant subjects at higher level, with Chemistry as a mandatory subject. Other two (2) relevant subjects should be from Physics, Mathematics or Biology. Candidates fulfilling the entry requirements must pass the multiple mini- interview (MMI) covering the pre-requisite pharmaceutical knowledge, attitudes, ethics and other critical skills needed for the program. Required to go through prescribed medical fitness examination and must be certified as fit to join the program [8].

Pharmacy Degrees Available. The degree awarded after 4 years is Bachelor of Health Science major in Pharmacy (N. Kifli "Personal Communication" June 8, 2022).

Program Accreditation. The program was recently implemented and is set to undergo AUN-QA (ASEAN University Network-Quality Assurance) accreditation (N.Kifli "Personal Communication" June 8, 2022).

C. Cambodia

Admission. Any student who has graduated from high school could apply to study. Selection is made through the national entrance examination organized by the Ministry of Health and the Ministry of Education, Youth, and Sport [9]. Some universities will require an entrance examination and an English proficiency test administered by the university if they elect to go to the international track [10]. The National Exam Committee determines the number of students that may be admitted to the different schools of pharmacy [S. Chea "Personal Communication, June 9, 2022].

Pharmacy Degrees Available. Cambodia has Bachelor of Pharmacy awarded after completion of the 5-year program (S. Chea "Personal Communication, June 9, 2022)

Program Accreditation. There is no accreditation pathway for pharmacy. For universities that have a general accreditation program, this is complied with by schools of pharmacy (S. Chea "Personal Communication, June 9, 2022).

D. China

Admission. Applicants must have completed high school and be 18 years old upon admission to the program. All students interested in higher education take a standardized college entrance examination during their final year of high school. Each school establishes a minimum examination score for admission. Students are admitted solely on the basis of these standardized entrance examination scores [11].

Pharmacy Degrees Available. China's Ministry of Public Health recommended that "the clinical pharmacist should take part in the diagnosis and treatment of disease, provide pharmaceutical care, and improve the quality of medical care" in 2002 [11]. China has two degrees awarded depending on the university; Bachelor of Science (BS) in Clinical Pharmacy and Bachelor of Medicine (BM) in Clinical Pharmacy, both programs are either a 5-year or a 4-year program [12]. There are no PharmD programs in the country. There are other options such as a BS to MS degree that will take 6 years to complete and a 7-year Master of Medicine [11]. Both degrees are considered as long-term

clinical pharmacy program [13]. Pharmacy practice experience (PPE) is 1.5 years for students from the 5-year program [14].

Program Accreditation. There is no independent accreditation body for pharmacy education in China. The Ministry of Education evaluates and approves programs from national higher institutions every 5 years [11].

E. Japan

Admission. Admission is conducted by individual schools.

Pharmacy Degrees Available. Since 2006 Japan has implemented the six-year baccalaureate degree where PharmD is awarded [15]. There is an option to continue studying for another four years to earn a doctoral degree [16].

Program Accreditation. Accreditation is done by a third-party similar to the system of US Pharmacy Schools done by Accreditation Council for Pharmacy Education. In Japan, the Japan Accreditation Board of Pharmaceutical Education (JABPE) conducts the full-scale evaluation since March 2012 when the six-year pharmacy education system was completed. Each pharmacy school conducts an internal quality check called the improvement cycle of self-evaluation. There is an external quality assurance to check and confirm whether the internal quality control system functions. JABPE carries out a peer review system which consists of three steps; each step is carried out by different committees and different members. The first step of review is undertaken by a peer review team consisting of three university lecturers and two pharmacists. The next step is done by the assessment committee composed of university lecturers, pharmacists, medical doctors, nurses, and lawyers. The last step is implemented by the superior assessment committee, which consists of university lecturers, pharmacists, medical doctors, nurses, lawyers, journalists, social workers, and other citizens [17].

F. Lao, People's Democratic Republic

Admission. After completing upper secondary school and an entrance examination, applicants can be admitted to the pharmacy schools [18].

Pharmacy Degrees Available. The country has 5 Pharmacy curriculums: 3 5-year programs namely Bachelor in Pharmaceutical Science, Bachelor in Pharmaceutical Care, and Bachelor in Traditional Medicines. A 3-year associate pharmacy degree and a 2-year Diploma of Community Pharmacy is also available [P. Sibounhueang "Personal Communication" June 8, 2022]

Program Accreditation. The information is not disclosed in their website.

G. Malaysia

Admission. The Pharmacy Board of Malaysia sets minimum qualifications for entry into a pharmacy degree program. When a school admits an applicant, it should imply selection for the profession. As the profession requires the highest standards of professional and personal conduct,

selection process should not be limited to academic standards alone. It is the responsibility of the pharmacy school to ensure that there is no particular circumstance that will impact upon an applicant's fitness to practice upon graduation. An understanding of science, especially chemistry and biology is important. A level of competence in English is important to complete the course. Applicants must attain at least a C grade in Malay Language and English in Sijil Pelajaran Malaysia (SPM) or equivalent before enrolling into the course. If the applicant is from high school, needs a CGPA 3.0 with a grade of BBB, ABC, or AAC in the following subjects: Biology, Physics or Mathematics, and Chemistry (with a minimum of B in Chemistry) [19] [20]

Pharmacy Degrees Available. The degree offered is Bachelor of Pharmacy (Honors). There are also other degrees such as Bachelor of Science (Pharmacy) and Bachelor of Pharmacy [N.M. Shah "Personal Communication" June 9, 2022].

Program Accreditation. The document, Standards on Approval and Recognition of Pharmacy Program issued by the Pharmacy Board of Malaysia provides guidelines on how to create mechanisms for program evaluation encouraging internal and external assessors' involvement. It also mentions about lecturers and students feedback process and inclusion of the stakeholders. The recognized pharmacy schools are listed in the website of Pharmacy Board of Malaysia [21].

H. Mongolia

Admission. Applicants may be admitted directly from secondary school based on their scores from the general entrance exam from Ministry of Education, Culture, Sciences, and Sports. This is the only criterion in the selection process of students. Applicants with high scores enter public pharmacy schools while those with lower scores would go to private schools [22].

Pharmacy Degrees Available. B.Pharm (5-year program) is the degree offered.

Program Accreditation. Pharmacy education at all levels is regulated by the Ministry of Education, Culture, Sciences and Sports of Mongolia. This agency is mainly responsible in planning, formulating, and maintaining norms and standards in technical education, including pharmacy. The accreditation of Pharmacy programs is completed by the National Board of Accreditation of Mongolia (NBAM) and all B.Pharm programs are accredited by the agency. While accreditation is voluntary, all institutions have applied and have been accredited by NBAM [22].

I. Philippines

Admission. Each school sets its criteria and guidelines for admission. This can either be through a standard exam, essay, and/or interview. Eligible students are those coming from high school having completed six (6) years of secondary education. Interested applicants who completed four (4) years of secondary education and university students from another program are eligible and will have to take all subjects in the program. Prior to 2018, accreditation of subjects could

be done to lessen the number of years to complete a degree in Pharmacy [23].

Pharmacy Degrees Available. The program is called Bachelor of Science in Pharmacy. Completion of the 4-year degree will allow the graduate to take the licensure exam for Pharmacy. Other universities have degrees such as Bachelor of Science in Clinical Pharmacy and even Doctor of Pharmacy; the former is a 5-year program while the latter is a 6-year program. Students coming from the 4-year BS Pharmacy program have the option to continue on in either program for a deeper understanding on clinical pharmacy. All three programs make the graduates eligible to take the licensure exam to become a registered pharmacist [23].

Program Accreditation. CMO 25 series of 2021 mentions that compliance to the stipulated policies and guidelines of this memorandum order will be jointly monitored by the Commission on Higher Education (CHED) and Professional Regulations Commission (PRC) regardless of the status of the school. The performance of the school in the licensure exam will also be monitored. Schools are encouraged to undergo external accreditation for quality assurance. The memorandum order stipulates compliance check on performance of the graduates in the licensure exam, outcomes/results of joint CHED-PRC monitoring and evaluation activities in the areas of dean/administration, faculty, curriculum and instruction (including mandatory topics in the syllabi for course integration), laboratory and physical facilities, library resources and other learning facilities, research, and internship (CHED accredited internship sites, preceptor and faculty internship coordinator, evaluation of internship program), and overall performance in the Pharmacist Licensure Examination. The action to be taken as a consequence of the monitoring and evaluation are also mentioned in the memorandum order [23].

J. Republic of South Korea

Admission. High school students take a national exam and they will be ranked according to their scores. The university one can apply to will depend on the score in the exam.

Pharmacy Degrees Available. The Pharmacy education program was extended to 6 years beginning with a 2+4 program from 2011. This admits students who have passed the eligibility tests after completing 2 years in an undergraduate program in a major other than Pharmacy. Applicants will need to show a transcript of the Pharmacy Education Eligibility Test (PEET), and satisfy the other requirements defined by each individual college. Beginning 2022, a 6-year curriculum is a second option which a university may choose to implement. The programs allow for a student to choose a major whether it be in education or practice. Education major focuses on clinical pharmacy and pharmaceutical science and practical learning are added to the credits while the practice program has 1400 hours of systematic practice program with mandatory practice hours (800 hours), and advanced practice hours (600 hours) [24].

Program Accreditation. Accreditation is done by Korean Accreditation Council for Pharmacy Education (KACPE). As of this writing, accreditation through KACPE is not mandatory but the association has applied to the Ministry of Education to be the recognized accrediting body for pharmacy education. KACPE makes a call for application for accreditation and interested schools will apply for it [25]. The accreditors are composed of academic professors and pharmacists from different practice areas. (C.G. Jang, "Personal Communication" June 3, 2022)

K. Singapore

Admission. Students applying to the Bachelor of Science Pharmacy (B.Sc. Pharmacy) must achieve good passes in the following subjects taken at the GCE 'A' Level Examinations or equivalent exams offered locally or overseas: (1) Singapore-Cambridge GCE-A Level: very good pass in H2 Chemistry; very good pass in either H2 Biology or H2 Physics or H2 Mathematics; (ii) International Baccalaureate: very good pass in HL Chemistry; very good pass in either HL Biology or HL Physics or HL Mathematics; (iii) National University of Singapore High School Diploma: major CAP of at least 4.0 in Chemistry and in either Biology or Physics or Mathematics [26]. Students admitted should declare their fitness to practice, in terms of health, aptitude, and attitude [27].

Pharmacy Degrees Available. Singapore offers Bachelor of Pharmacy with Honors. If the student does not qualify an honors degree, a Bachelor of Science (Pharmacy) will be awarded. Both are 4-year programs [26]. There is also a Bachelor of Science (Pharmaceutical Science) program which can be completed in 4 years [27].

Program Accreditation. Program quality assurance is built into a process where feedback and review are regularly conducted [28].

L. Vietnam

Admission. There are various ways to be admitted to the program. An applicant having completed 12 years of formal education must pass the National Higher Education Examination and obtain Higher Secondary Certificate. Depending on which school they will apply to, there are three alternative examinations: the National University-Entrance Examination, the National College-Entrance Examination given by the Ministry of Education and Training; or a Local Entrance Examination conducted by some individual schools. Depending on the score of these examinations or grades on high school continuous assessments, an applicant will be admitted to first-level program. Upon completion, students who want to continue will have to sit for and complete a competitive entrance examination organized by individual schools. Admission to Secondary Diploma in Pharmacy depends on grades from Elementary Diploma in Pharmacy program. Other mechanisms of admission include (1) the direct recruitment of candidates from ethnic groups after they have followed a preparatory course, or of high school students who have obtained a national or international award in chemistry, etc.; (2) lower admission criteria (extra points added to the candidate's entrance score) for specific groups, e.g. applicants contracted by local authorities (after

graduation students are then obliged to work in the locality in which they were recruited), students from remote areas, etc. Nevertheless, the candidate’s entrance score must be above a cut-off point set yearly by the Ministry of Education and Training. From obtaining a Higher Secondary Certificate, an applicant can move up the ladder to Elementary Diploma in Pharmacy to Secondary Diploma in Pharmacy, or straight to College Diploma in Pharmacy, or straight to Bachelor of Pharmacy. Years spend on each level will vary and there will be requirements before exiting at each level [29].

Pharmacy Degrees Available. Technical high schools can train Elementary Diploma (1 year) and Secondary Diploma (2 years) in Pharmacy. Colleges can train College Diploma in Pharmacy (3 years) but only universities can award Bachelor of Pharmacy (5 years) and post graduate degrees. There is flexibility in schooling to become a pharmacist as after 1 year the student can opt to work or continue on to the next level [25].

Program Accreditation. The General Department for Educational Quality Assurance, Accreditation, and Testing under the Ministry of Education and Training conducts

accreditation of schools at the national level. There is no specific system for pharmacy education. Since 2007, each pharmacy school is required to have a Unit for Quality Assurance, Accreditation, and Testing that is responsible for quality assurance at the institutional level. The process of quality assessment must include internal assessment by the school, external assessment by the Ministry of Education and Training, and an accreditation decision. This assessment is mandatory. This is the first step in improving the quality of pharmacy education in Vietnam [29].

Looking at the admission guidelines, degrees available, and accreditation processes of selected schools in the Western Pacific Region, this information are made available and declared except for Lao PDR where there was no available information on accreditation. Brunei recently offered the pharmacy program and has only one university with such program. On the other hand, Singapore’s pharmacy program has been around since 1965 and remains to be the only pharmacy school in the country. The Philippines has over a hundred pharmacy schools being an archipelago, to make the program available to as many students as possible.

Country	Years of Study	Degree Awarded
Australia	4 years; 2 years	Bachelor of Pharmacy; Master of Pharmacy
Brunei	4 years	Bachelor of Health Sciences major in Pharmacy
Cambodia	5 years	Bachelor of Pharmacy
China	5 years	Bachelor of Science in Clinical Pharmacy, Bachelor of Medicine in Clinical Pharmacy
Japan	6 years	Doctor of Pharmacy
Lao, PDR	5 years; 3 years; 2 years	Bachelor in Pharmaceutical Science, Bachelor in Pharmaceutical Care, and Bachelor in Traditional Medicines; Associate in Pharmacy; Diploma of Community Pharmacy
Malaysia	4 years	Bachelor of Pharmacy (Honors), Bachelor of Pharmacy, Bachelor of Science in Pharmacy
Mongolia	5 years	Bachelor of Pharmacy
Philippines	4 years	Bachelor of Science in Pharmacy
Republic of South Korea	6 years	Doctor of Pharmacy
Singapore	4 years	Bachelor of Science in Pharmacy, Bachelor of Science in Pharmaceutical Science
Vietnam	5 years	Bachelor of Pharmacy

Table 1:- Pharmacy Degrees from Selected Countries in the Western Pacific Region

On admission guidelines, most countries have either a national exam or national guidelines set for the applicants and accepting schools to refer to while a few others (Japan and Philippines) have an entrance exam set by the schools. For Mongolia, the applicants with high scores can go to public schools while those with lower scores have to opt for private

schools. Language proficiency in English is required by schools in Cambodia and Malaysia. Brunei and Malaysia additionally assess the applicants on their fitness to join the program.

It is interesting to note that most schools have opted for at least 5 years of education towards the degree that serves as entry requirement to practice pharmacy. The schools that have retained 4 years, have different circumstances which cannot generate a single assumption. Vietnam's pharmacy degree takes 5 years to complete but it has a ladderized scheme allowing students to progress year by year and providing a diploma at the end of each year.

Australia and Malaysia have a mandatory accreditation requirement; Brunei's pharmacy program is in its infancy and changes are likely in the years to come. Singapore has a lone pharmacy school with a new program, Bachelor of Science in Pharmaceutical Science which is being reviewed annually. While not all schools submit to an accreditation body specific for pharmacy education, there are internal assessment and evaluation systems in place. Even without an accreditation program specific for pharmacy, the Ministry of Education or its equivalent per country encourages continuous review of programs. Australia, Japan, Mongolia, and Republic of South Korea have accreditation agencies specific for pharmacy.

III. PHARMACY CURRICULUM

Some countries in the Western Pacific Region have documents that state their curriculum. Terminologies used are indicative curriculum, minimum curricular content, or model curriculum. There is a mandatory minimum curriculum but the institutions can always add to it.

Curriculums across countries have the same focus with differences in specific subjects or topics. Prescribing a minimum curriculum ensures that essential knowledge and skills are taught and enhanced at the undergraduate level. Accreditation agencies for programs look into the compliance of the minimum curriculum. Additional areas of focus designed are considered added-value already. Schools articulate their competency standards and program outcomes which will guide them in the design of the teaching and learning activities and assessment. Most schools put emphasis on 21st century skills like communication and collaboration, leadership and management, and research.

In the light of COVID-19 pandemic where lockdown and quarantine meant limited movement among citizens, schools were greatly affected by these measures to curb the spread of the infection. Schools had to make a drastic shift in program delivery to adapt to the situation. Of important consideration were teaching-learning activities, assessment and evaluation, and experiential learning.

Australia have long veered away from didactic lectures and have adopted the use of technology and had small group discussion pre-pandemic. The interactive lectures were maintained as teachers provided recorded lectures embedded with activities and feedback. Students used various platforms such as Google Docs for collaboration. Assessment was in the form of online quizzes in the learning management platform, Objective Structured Clinical Examinations (OSCEs) were either video recording submissions or via ZOOM with breakout rooms, depending on the station. End-semester-exams were amended to make them suitable for

online, open-book, non-invigilated delivery. Experiential learning continued with many student-interns supporting the frontliners during the pandemic. This was the decision of the Council of Pharmacy Schools [30].

In Malaysia, the changes had the support of the Pharmacy Board of Malaysia and several other government agencies important to education, health, and safety. Schools had to switch to online delivery taking into consideration the capabilities of the students, academic staff, resources, and facilities. Using video recording, virtual simulation, and other remote methods especially for laboratory teaching, and adjusting passing mark to 80%. Assessments were converted to take-home- exams, open-book-exams, online exams, etc., depending on suitability, and experiential learning hours were adjusted to a minimum and supplemented with videos, lab simulations, mock pharmacy, pilot plants, virtual simulations, or any other suitable resources to the attachment that could achieve the learning outcomes. Schools with their own teaching hospitals and pilot plant facilities were better adjusted and had some advantages. Research was converted to non-lab topics such as reviews, and online surveys [30].

Mongolia converted its delivery of pharmacy education online as this is encouraged by the Mongolian Law of Education and Health. The schools also have policies governing the conduct of e-learning. Mode of delivery of classes used different available online platforms offered by Google and Microsoft. The Ministry of Education and Science created the "telephone-e-education" where educators and students can ask questions pertaining to online learning. The schools also have facilities to assist teachers in preparing high quality materials for online learning [30].

In the Philippines, the conversion to online delivery from the traditional face to face classes pre-pandemic proved to be challenging. The availability of appropriate gadgets and the internet connectivity were the main hindrances. The shift required an unexpected cost on the part of the learners and educators. Available resources were limited at that time and the sudden need to purchase applications and software entail an expense on the part of the schools that will have to be shouldered by the students. Teaching and learning, as well as assessment were converted to online mode [30]. The Commission on Higher Education (CHED), issued CMO 5 series of 2021 on April 30, 2021 to govern experiential learning component of the program. It paved the way for internship to proceed via online modality so students eligible do not have to stop and will be able to graduate as indicated in their study plan [31].

Pharmacy schools in Japan were also affected when their government declared a nationwide state of emergency in April 2020. Schools have to make guidelines according to the Council on Pharmaceutical Education and the government. Online delivery of classes meant students and teachers had to regularly communicate as feedback on this new mode was important. Thesis requirement was done at home or if laboratory use was necessary, precautions were in place to avoid infection. To ensure that learning does not stop, government, universities, and industries collaborated to create a framework that will allow the use of copyrighted

materials for educational purposes. Students enjoyed tuition waiver or reduction, loans, and subsidies to purchase equipment for online classes. The country is looking at how these investment in technology can be carried on and integrated to pharmacy education, post-pandemic [32].

It will be interesting to see how the challenges faced during the pandemic will bring about positive changes that will advance the delivery mode of pharmacy education. In the same way, the limitations faced may be addressed and provided with long-term solutions. Setting up a pandemic-proof education delivery will allow flexibility and easy adaptation as needed.

IV. PHARMACY OVERHAULING TO ADDRESS CURRENT HEALTH CARE NEEDS

The 2013 FIPeD Global Education [4] report called for a needs-based approach to education for better health outcomes. As the roles of the pharmacists have continued evolving to include more patient-oriented services, it is prudent that pharmacy education be designed accordingly. The transformation should deliver the skills needed by students to work in different pharmaceutical settings once they become professionals. As students, they need to have the environment and opportunities to approach real life problems in a comprehensive and multidisciplinary way. The collaboration between pharmacy schools and practice sites such as drugstores and hospitals to name a few, is an important step to guarantee that what is taught in school is what is done in workplace.

Australia has beefed up its hours of supervised practice to 1824 as a requirement for registration. They also have pathways to allow registered pharmacists to gain specializations and for graduates from allied medical sciences to be able to register as a pharmacist [6]. China puts focus on clinical pharmacy education to the extent of including medical practice and pharmacy medical practice in its curriculum. They have one year of practice putting more emphasis on development of empathy and service conscientiousness [13]. Japan sought to improve pharmaceutical sciences as an integrated science consisting of basic pharmaceutical sciences and clinical pharmacy. The model curriculum is outcomes-based and have also been established for other health care related courses. There is a move to encourage interaction among students from various health care related courses through inter-professional education in the hope of developing better health care professionals [17]. The country's health care system is shifting to care at home and pharmacists are expected to contribute to home care [4]. Mongolia recently revised its Pharmacy curriculum to expand it to include clinical pharmacy in the hope to create employment opportunities in practice areas and improve the level of pharmaceutical care. The Philippines changed its Pharmacy curriculum effective 2018 to accommodate the graduates coming from the 6-year high school program. This allowed for the deletion of some basic topics since they were covered in high school. It also considered the current need of the country for a better health care workforce hence the inclusion of more clinical pharmacy topics and locally relevant subject, complementary and

alternative medicine. The experiential learning requirement was set at the last year of the program with additional two areas (Public Health and Regulatory, Institutional Pharmacy) with the existing areas (Community, Hospital, and Industry) for a total of 1200 hours [22]. In South Korea, they implemented the 6-year curriculum in 2009 with an understanding that the 4-year program was considered insufficient to perform pharmacy practice today. However, they have not neglected to update their pharmacists who completed the old curriculum. Trainings are continuously made available [33]. Singapore understood the needs of its country and thus have separated the clinical pharmacy and pharmaceutical science tracks. They have post graduate course options with focus on advancing clinical skills of pharmacists. Vietnam is looking at standardizing its pharmacy curriculum having something like what other countries may call a core curriculum or model curriculum.

A well-designed program should be locally-determined, socially accountable, globally connected, and quality assured to meet the health needs of the community. The rapid expansion in the number of schools in some countries could challenge quality of teaching and learning. Workplace education in collaboration with practitioners, inter-professional education for developing skills to work as a health care team member, and student-centered learning to achieve the problem-solving skills and application of knowledge to real life problems. With all these ongoing changes in pharmacy curriculum to shape the education, better approaches to continuing education and practitioner development models for existing pharmaceutical health care workforce should be provided [4].

V. LESSONS FROM THAILAND AND UNITED STATES OF AMERICA

The US-Thai Consortium for Development of Pharmacy Education in Thailand was organized in 1994 when 9 schools of pharmacy from the US and the American Association of Colleges of Pharmacy signed a memorandum of agreement with 8 pharmacy schools in Thailand and the Committee for Pharmacy Manpower Development of the Thailand Ministry of University Affairs. The consortium is now composed of 18 Thai and 16 US schools and is for consideration for renewal this 2022 to extend to 2037. The long-term goal of the program was to expand the number of pharmacy schools and pharmacy faculty members in Thailand, and the subsequent training of additional pharmacists for practice; thereby, strengthening both pharmacy education and practice to improve the health and welfare of the Thai people [34]. This partnership focused on needs-based training allowing students, practitioners, and scientists to undertake government subsidized advanced pharmacy and pharmaceutical studies to build capacity for the academic workforce. The scholars return to Thailand as clinicians, educators, and researchers. These helped with the transition to the PharmD curriculum [4]. The Board of Pharmaceutical Specialties was created by the Pharmacy Council in 2001 to promote the advancement of the profession through recognition of areas of specialized training, knowledge and skills in pharmacy and certification of pharmacist specialist in those areas. The first area of

specialty is Pharmaceutical Care. With this board and recognition of specialist pharmacists, it was inevitable that pharmacy education integrates more clinical pharmacy courses and competencies to make the graduates workplace-ready [35].

A paper published in 2012, pointed out some of the key relevant factors to consider when developing a patient-oriented curriculum. (1) Quality and quantity of faculty (basic science, social/administrative, and pharmacy practice) for a patient-focused or clinical pharmacy curriculum [36]. Faculty members should not only be excellent in research and service (including clinical service) but must also be excellent teachers who possess scholarly teaching ability. There should be an adequate number and mix of faculty with appropriate academic titles and experience within each discipline. There is a strong suggestion to ensure that there is an adequate number of qualified faculty members before a school will start a PharmD program. This may entail financing individuals to obtain PharmD degrees or similar overseas along with residency training. (2) Patient care practice model for pharmacy education programs-what, where, and who pays for the services [36]. In the US, they have medication therapy management, coagulation clinics, diabetes clinics, asthma and chronic obstructive pulmonary disease clinics among others which are manned by a pharmacist. (3) Curriculum quality control and teaching assessment [36] shown by submission for accreditation is important to ensure that outcomes are met and fulfilled by the curriculum.

Some US schools of pharmacy offer a PharmD program to train international pharmacists and a consortium between countries is not necessary. The sending country can nominate a pharmacist to a school to receive training. Upon completion, the pharmacist goes back to his home country to apply what he has learned. Some US schools have the distance-based post baccalaureate North American-Trained PharmD degree program where the pharmacist can complete some parts of the program online (offsite) and are only required to be on campus (onsite) for a prescribed period of time. This way, the pharmacist need not leave his job and will just need some days off from work [37].

VI. CONCLUSION

The number of years in the curriculum of different countries still vary. This may not be the determinant of a successful program. Instead, accreditation may have more weight as quality assurance is an important aspect to ensure that while the curriculum evolves, it remains responsive to the local and national needs. The course contents across different countries are similar and perhaps the difference would be in the teaching-learning-assessment aspects. As the profession grows with the health care needs of the nation, it continues to make necessary changes. Countries in the western pacific region can form alliance to convene in more formal settings for exchange of ideas, collaboration between students and faculty, and engagement to share best practices. These are ideas from the US-Thai Consortium which dates back to 1994 and has paved the way to help improve each other's pharmacy education and eventually, pharmacy practice.

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