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COVID-19 SPECIAL COLLECTION

RESEARCH ARTICLE

Pharmacy education during and beyond COVID-19 in six Asia-Pacific countries: Changes, challenges, and experiences

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Abstract

The COVID-19 pandemic shifted pharmacy education to remote teaching and learning (T&L) strategies. To share changes, challenges, and experiences in pharmacy education among member countries, the Federation of Asian Pharmaceutical Associations hosted a 1.5-hour webinar on 15th May 2020. Questions collected during registration and the live webinar were coded using thematic analysis. A total of 794 participants from 18 countries/territories registered, while 346 attended the webinar. Of 445 questions, 392 were from the registration form and 53 from the webinar. All questions were coded to four major themes: new normal pharmacy education, ethics and safety, material accessibility, and teaching and evaluation methods. Questions during registration were mostly on new normal adaptation (n=79), T&L formats (n=65), and access/resources/sustainability (n=59). Webinar questions were mainly on assessment format (n=13), laboratory skills (n=9), and access/resources/sustainability (n=9). The webinar provided an opportunity to quickly identify issues regarding pharmacy education during the COVID-19 pandemic for prompt actions and further research.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has pushed higher institutions of learning to quickly adjust their teaching and learning (T&L) strategies in order to comply with international and national safety measures, including reduced movements of staff and students due to lockdowns, movement control orders (MCO), and international border closures. Hence, institutions employed online-based T&L using various information technology (IT) platforms. Staff and students faced challenges to ensure seamless delivery of synchronous

and asynchronous online teaching, including remote delivery, experiential placements, and academic integrity with assessments. It is important for educators to not only be agile and flexible with the manner in which teaching is delivered but also to show empathy and patience to students as well as to each other (Brazeau & Romanelli, 2020).

Pharmacy programmes worldwide faced similar challenges, especially with hands-on practical sessions and experiential learning. Hence, the Federation of Asian Pharmaceutical Associations (FAPA) hosted a webinar with the main objectives of sharing the challenges and adaptations in pharmacy education in the Asia-Pacific Region, as well as discussing the implemented actions and potential solutions. Furthermore, the webinar was an opportunity to bring together additional pharmacy- related T&L issues for discussions through questions from participants. This paper discusses the situation and recommendations from six countries in the Asia-Pacific Region (Australia, India, Indonesia, Malaysia, Mongolia, and the Philippines) and provides insights into the primary concerns of pharmacy educators who registered for and attended the webinar. The findings from this webinar can be used to implement further research related to pharmacy education during and post-COVID-19.

Aim

The aim of this study is to share, gather, and analyse information regarding changes in T&L of pharmacy programmes in the Asia-Pacific Region due to the COVID-19 pandemic.

Objective

The objective of this study is to identify issues or challenges faced by pharmacy academics regarding remote T&L during the COVID-19 pandemic.

Methods

A webinar called 'Pharmacy Education During and Beyond COVID-19: Changes, Challenges and Country Experiences in Asia-Pacific' was organised by the FAPA Pharmacy Education Section with the assistance of the FAPA Secretariat on 15th May 2020 at 3:00 p.m. – 4:30 p.m. GMT +8:00. It was moderated by the FAPA Pharmacy Education Section Chairperson with speakers from Australia, India, Indonesia, Malaysia, Mongolia, and the Philippines. Registration was first posted on 11th May 2020 via Facebook, and those who registered were provided with the opportunity to submit their questions about their main concerns in pharmacy education in the current situation brought about by COVID-19. The webinar was hosted using Zoom Webinar. A total of 794 participants from 18 countries and territories registered for the event and 346 people attended the live webinar.

Each speaker provided a ten-minute presentation, and the session ended with a moderated Question & Answer session (Q&A) of selected questions submitted prior to the webinar. Participants were also given the opportunity to ask questions during the webinar using the function on Zoom. These were answered live via chat and also during the moderated Q&A session. The key points of the presentations were then summarised.

Permission was granted by the FAPA to use the submitted questions before and during the event, ensuring the confidentiality of participants by removing all personal, identifiable information. All submissions from the academic pharmacists who registered for the webinar and all questions received live were processed using thematic analysis to search for familiar recurring themes, ideas, or trends in the data, which provided a perspective of communication (Allen, 2017). Together, the inputs from the webinar speakers and participants provide insights into the common issues affecting pharmacy education in Asia during the COVID-19 pandemic.

Qualitative analysis

In total, 445 questions (392 from the registration form and 53 during the webinar) were posted by the participants. An inductive approach was applied to the coding of the questions. Two researchers coded the list of questions independently with any discrepancies then discussed until consensus was reached. Qualitative data coding and retrieving were done using Microsoft Word macros (Ryan, 2004).

Results

Eleven codes were obtained from a total of 446 questions; 393 were received from the registration forms and 53 from the chat box during the webinar. Several questions from the live chat box were allocated to multiple codes, increasing the total of coded questions to 455. All codes were categorised into four major themes: 1) new normal pharmacy education; 2) ethics and safety; 3) material accessibility and 4) teaching and evaluation methods. Table I below shows details the sources, number of codes in the respective theme.

Table I: Themes, codes, sources, and frequency of questions (n=455)

Question theme	Question code	Question source	Frequency
New normal pharmacy education	New normal adaptation	Registration form	79
	Guidelines and recommendations	Registration form	9
Ethics and safety	Academic integrity	Registration form	2
		Live chat box	5
	Safety of returning to face-to-face	Registration form	18
		Live chat box	1
Material accessibility	Access/resources/sustainability	Registration form	59
		Live chat box	9
Teaching and evaluation methods	Assessment format	Registration form	30
		Live chat box	13
	Internship/practicum	Registration form	50
		Live chat box	7
	Laboratory skills	Registration form	37
		Live chat box	9
	Research projects	Registration form	27
		Live chat box	4
	Teaching and assessment tools	Registration form	17
		Live chat box	6
	Teaching format	Registration form	65
		Live chat box	8

In general, pharmacy educators were interested in learning about the effects of the COVID-19 pandemic on pharmacy education and how the academic community should best respond to the situation to ensure continued quality education and training of students. Participants provided more questions and feedback about their main concerns during the pandemic using the registration form (n=392) than compared to the live Q&A box during the webinar (n=53). The most common concerns were about teaching and evaluation methods applicable during the COVID-19 pandemic (n=273), while other main concerns of pharmacy educators were about new normal pharmacy education (n=88) and material accessibility (n=68), followed by ethics and safety (n=26). The breakdown of the themes and main concerns of pharmacy educators is shown below in Figure A.

1.1.Teaching and evaluation methods

Participants were concerned about how online learning might affect peer learning, which is perceived as beneficial for pharmacy students. There was also interest in exploring ways to support peer learning in the current situation.

> *'I'm worried the online learning would affect the peer learning which is one of [the] effective mode[s] of learning. What extent would it be and is there any data related to this?'*
>
> [Q59, live chat box, 'Teaching format' code]

Pharmacy education includes placements, internships, and practicum, as experiential and hands-on learning is necessary for students to acquire the relevant knowledge

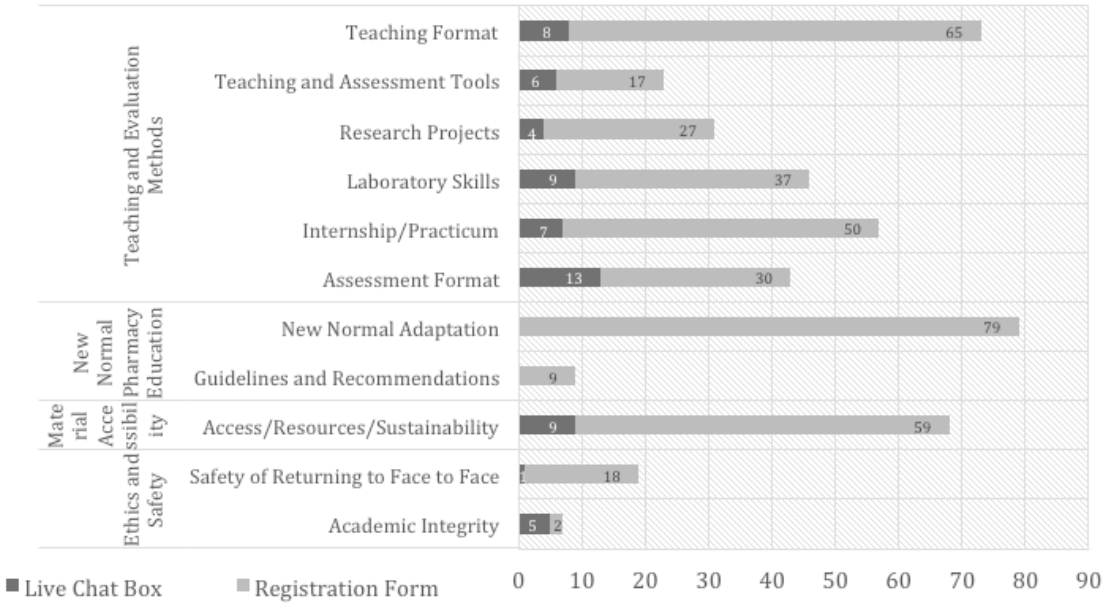

Figure A: Resulting themes and frequencies of each code generated from the qualitative analysis of questions/ feedback from webinar participants

and skills effectively. Participants were interested to know about possible alternatives for experiential learning when it is not possible to bring students physically to the laboratory and practicum sites.

> *'Are there any alternatives [that] you can suggest to us* [with] *regard to doing the internship of the students since they can't go on a physical setting?'*
>
> [Q30, live chat box, "Internship/Practicum" code]

> *'In this time of COVID-19, wherein laboratory classes can't be performed physically in [a] classroom setting, what alternatives can you suggest so that the skills needed to be acquired in the laboratory can still be acquired by the students?'*
>
> [Q35, live chat box, 'Laboratory skills' code]

Participants were interested to know how assessments can be conducted online. Considering the many limitations of the online approach, when compared to traditional ways of assessing students, the use of purely online methods of assessment was fairly uncommon until now. They also wanted to know how other participants evaluate their students using online examinations.

> *'What type of questions comprises your exams; more on comprehension and analysis questions and less knowledge type of questions (i.e., definition, identification)?'*
>
> [Q15, live chat box, 'Assessment format' code]

The participants mentioned that the pandemic has also been affecting postgraduate students, such as when some research projects had to be discontinued. Participants were interested to know more about what other universities are doing to enable graduate students to continue their research projects.

> *'I would like [to] request some insight [from] all the potential speakers on handling students research during this COVID-19 situation.'*
>
> [Q45, live chat box, "Research projects" code]

Since many participants perceive that pharmacy educators were generally used to traditional methods of face-to-face teaching prior to the pandemic, they wanted to know how educators can be trained and equipped with the necessary skills to help them ensure that students achieve the required learning outcomes through remote learning.

> *'How will we train and equip educators so that learning outcomes will be achieved despite the limitations brought by remote learning platforms as part of new normal in education?'*
>
> [Q11, registration form, 'Teaching and assessment tools' code]

1.2.New normal pharmacy education

T&L have been greatly affected by the COVID-19 pandemic, especially with the enforced movement restrictions to prevent the disease from spreading in many countries. As an example, the Government of Malaysia enforced a MCO, starting on 18th March 2020, to break the chain of virus transmission (Shah *et al.,* 2020). Participants wondered how this movement limitation would affect pharmacy education and how schools should adapt and address the situation.

> *'How is Pharmacy Education going to adapt to the new normal?'*
>
> [Q1, registration form, 'New normal adaptation' code]

Since it is still unknown how long the COVID-19 pandemic will last, administrators are looking for guidance and recommendations on how to address the various problems brought about by the pandemic. Moreover, some are wondering whether the pharmacy curriculum needs some changes to enable pharmacists to be better equipped in responding to pandemics like COVID-19 in the future.

> *'Is it advisable to make certain adjustments in the education curriculum to better equip pharmacy students and educators in handling cases such as COVID-19?'*
>
> [Q4, registration form, 'Guidelines and recommendations' code]

1.3.Material accessibility

For educators and students shifting to an online approach and remote T&L, the major concerns would include the additional cost of equipment, the Internet connection, and the subscription to software and web-based platforms. The participants wanted to know how institutions provide financial support or benefits to both students and faculty to facilitate access to remote learning.

> *'Does your university provide internet incentives to faculty who are teaching online?'*
>
> [Q6, live chat box, 'Access/Resources/ Sustainability' code]

Some students and teachers may not have access to a stable Internet connection due to the limited infra-structure in their location. In this case, financial support may not be enough to support faculty and students located in geographically isolated and disadvantaged areas. There were reports of students and faculty stranded in villages far from any town who have difficulty accessing cybercafes to access the Internet. Participants wanted to know how other universities addressed these concerns.

> *'What are your strategies to deliver the lecture, activities, and exams for students without internet connection?'*
>
> [Q6, registration form, 'Access/Resources/Sustainability' code]

> *'What will be the best approach to learners with NO access to internet?'*
>
> [Q11, live chat box, 'Access/Resources/ Sustainability' code]

1.4.Ethics and safety

Globally, there is a strong consensus that the most effective approach to sustainably controlling the COVID-19 pandemic is potentially a COVID-19 vaccine (Koirala *et al.,* 2020). However, before finding the vaccine, universities could be opened with a strict social distancing procedure after the recovery of the MCO. Participants were interested to know how pharmacy schools are preparing for the possible reopening of schools and return to face-to-face classes.

> 'If universities will allow F2F teaching, how are we going to guarantee that the infrastructure will allow for social distancing protocols to be carried out appropriately?'
>
> [Q48, live chat box, "Safety of returning to face-to-face" code]

Student assessments can be classified as a summative or formative assessment, the latter of which aims to generate meaningful feedback for students to improve their future performance (Watling & Ginsburg, 2019). Evaluation of online learning using e-testing software is becoming an increasingly common practice, despite the rare implementation of summative assessment in higher education (James, 2016). However, many educators are still concerned about the issue of integrity, especially in conducting online summative assessments, and they wanted to know how other educators are preventing various forms of academic dishonesty.

> 'How are you addressing issues on integrity of summative assessments done online?'
>
> [Q2, live chat box, 'Academic integrity' code]

2. Experiences in the Asia-Pacific Region

2.1 Australia

At the Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, the existing pre-pandemic teaching has a strong emphasis on self-directed and interactive learning. Lectures are not didactic by nature, and students have face-to-face small group instruction on campus on a weekly basis. On the one hand, the faculty was met with fewer challenges to convert didactic material to remote online delivery due to the existing materials on self-directed learning. However, on the other hand, the copious amounts of face-to-face small group workshop instructions, with a greater focus on skill development, proved challenging after quarantine and when movement restrictions were implemented.

The requirement for synchronous learning during remote online delivery was reduced. Interactive lectures are a hybrid of asynchronous and synchronous delivery. Interactive lectures are built for asynchronous delivery in their Learning Management System (LMS) (i.e. Moodle) and remain interactive through recorded lecture material with embedded activities and feedback. Synchronous lectures are delivered using video-conferencing technology (i.e. Zoom Webinar) where the webinar functionality allows for large numbers of student participants, as well as the ability to ask questions live in an organised manner utilising the Q&A function. Workshops are delivered synchronously using video-conferencing technology (i.e. Zoom Meeting) and breakout rooms for small group discussions and activities. Students utilised Google Docs or other forms of collaborative platforms to complete their workshop activities and discussions. In-semester assessments during remote delivery were undertaken online as quizzes in the LMS. Objective Structured Clinical Examinations (OSCEs) were converted to video recording submissions and live OSCEs via Zoom with breakout rooms depending on the nature of the OSCE stations. For end-of-semester exams, questioning styles were amended to ensure that valid items were suitable for online, open-book, non-invigilated delivery.

In response to experiential placements in pharmacy education, The Council of Pharmacy Schools in Australia and New Zealand collaborated on fundamental guiding

principles for pharmacy students' clinical education during COVID-19 (Council of Pharmacy Schools, 2020). The council re-emphasised the importance of experiential placements in pharmacy education and the necessity for this to continue during COVID-19 to better prepare graduates for future pandemics such as this one. Pharmacy students have also been contributing to the COVID-19 frontline in their experiential placements (Dooley, 2020; Monash University, 2020).

2.2 India

With more than 3 million COVID-19 infection cases as of August 2020, India is experiencing accelerated uptake of digital solutions, tools, and services, speeding up the transition towards digital education (Sharma, 2020). Locally, Digital India Vision has emerged as a vital instrument in providing solutions to the present crisis in education as well as other sectors. It has been mandated to experiment and display new tools for pharmacy education delivery to be as meaningful to students as possible. Since the pharmacy colleges and schools were shut down, the Government of India, as well as state governments, have relied on information technology to regularly disseminate information on various initiatives, undertaken by the Ministry of Human Resource Development (MHRD), Department of Technical Education, National Council of Educational Research & Training (NCERT), and others, to facilitate the education of future pharmacists.

Several initiatives have been implemented to furnish future professionals with a fast-paced shift towards digitalisation in T&L, including Swayam, a programme initiated by the Government of India and designed to achieve the three cardinal principles of education policy, namely, access, equity, and quality. The main objective of Swayam is to take the best T&L resources to all by providing massive open online courses. In addition, e-PG Pathshala, an initiative of the MHRD under its National Mission on Education through Information and Communications Technology (NME-ICT), provides quality-, interactive-, and curriculum-based e-content in 70 subjects. Other initiatives include the YouTube channel of the Consortium for Educational Communication set up by the University Grants Commission of India (CEC-UGC), Vidwan - a database of experts who provide information peers and prospective collaborators, the National Educational Alliance for Technology (NEAT) - an initiative by the All India Council for Technical Education (AICTE) based on the Public Private Partnership (PPP) model to enhance the employability among students in collaboration with education technology companies, and the National Digital Library (NDL) - a repository of learning resources with a single-window facility. Other noteworthy initiatives have been taken up as well, like the Spoken Tutorial project, the Free and Open Source Software for Education (FOSSEE), e-Yantra, Google classroom, etc. (Barman & Das, 2020).

To strengthen the mega digital platforms, the Government of India, as well as state governments, have created and improved the infrastructure to deliver e-education. This includes the National Knowledge Network (NKN), the National Project on Technology Enhanced Learning (NPTEL), the National Mission on Education through Information and Communication Technology (NMEICT), and the National Academic Depository (NAD), among others. Furthermore, the NKN provides high-speed network backbone to educational institutes in India. These initiatives supply the needed support for the current education system and enhance access to e-learning resources.

2.3 Malaysia

In accordance with the instructions of the Malaysian Prime Minister on the MCO from 18th March 2020 to 14th April 2020 (1st phase), all educational institutions were ordered to be closed and the operation of compulsory academic programmes was suspended. Shortly after the MCO started, all higher education institutions offering pharmacy programmes in Malaysia received guidelines produced by the Pharmacy Board Malaysia (PBM) together with the Ministry of Higher Education (MOHE), the Malaysian Qualifications Agency (MQA), and other relevant authorities such as the Ministry of Health (MOH) and the National Security Council (Malaysian Qualifications Agency, 2020; Pharmaceutical Services Programme: Ministry of Health Malaysia, 2020). The requirements for conduct of pharmacy programmes in Malaysia during and post-MCO include: (1) following the Standards on Approval and Recognition of Pharmacy Programme 2018, as well as the MOHE and the Malaysian Qualifications Agency (MQA) guidelines on the content of the programme; (2) switching all T&L activities into online delivery as an alternative with some flexibility based on the guidelines issued by the MQA on 29th March 2020; (3) taking actions to modify T&L components from face-to-face (FTF) into fully online, depending on the readiness of students, academic staff, resources, and facilities; (4) conducting laboratory practical components via video recording, virtual simulation, or other available remote methods; (5)

adjusting assessment and evaluation including in-course assessment (ICA) based on Student Learning Time (SLT) or credit hour which achieve at least minimum 80% to be considered as achieving the credit requirement; (6) rearranging the duration for fulfilling the minimum standard of experiential learning components such as hospital pharmacy, community pharmacy, and industrial pharmacy attachment, which, alternatively, may cover some components using videos, lab simulations, mock pharmacy, pilot plants, virtual simulations, or any other suitable resources to the attachment that could achieve the learning outcomes; (7) replacing assessments, especially the high-stake examinations, with take-home-exams, open-book-exams, online exams, etc., depending on suitability, and (8) ensuring the examination conducted in the remote or online environment is able to assess the students' learning outcomes while also considering validity, reliability, and fairness, because the students are taking the exam in many different environments.

Subsequent to these guidelines, all institutions switched their T&L delivery almost immediately to online mode using existing teaching materials. Although all institutions have their online T&L or e-learning system in place as part of the requirements in conducting a pharmacy programme, there were challenges in adopting these within a short time, especially for the component that requires skills and hands-on practice.

Fortunately, a number of pharmacy institutions were equipped with e-learning facilities and platforms and had already been practicing recording online lectures, etc. Alternatively, for a lecture some applications like live lecturing, Sync MS Teams, and voice-over PPT were used, and for small group tutorials applications like Sync MS Teams, Zoom, and WhatsApp were applied. However, some e-learning materials only used the intranet platform. Hence, license upgrading needed to be made to make it available outside the campus. Another challenge faced was Internet connection stability which depends on the service providers and the area of the resident.

For skill-based T&L, including laboratory practical, institutions used videos and educational online resources (e.g. Labster.com), or live discussions during skills development sessions via MS Teams, etc.; while some were given the flexibility to reschedule. For the final-year research project, the institutions assigned non-lab-based research projects, including article reviews, online surveys, phone interviews, etc., acknowledging the limited online resources that could meet the learning objectives and outcomes. Students provided in their feedback that they prefer the hands-on practical, especially for those involving pharmaceutical sciences such as pharmaceutical chemistry, pharmaceutics, and pharmacology.

On the readiness and challenges for experiential learning/attachment for the final or clinical year, some institutions, mainly the public universities, have their teaching hospital, a community pharmacy (mock pharmacy), and also a pilot plant for the pharmaceutical industry, so these facilities could cover some of the learning objectives required. Other institutions used videos and online materials of selected clinical practices, patient counselling, and lab or manufacturing simulation, etc. Having said that, challenges were faced for hospital attachments, especially when the hospitals were being designated as COVID-19 hospitals or when hospitals no longer accepted pharmacy students' attachment due to safety concerns. For other hospitals, because of social/physical distancing practice, there was only a limited number of students allowed, so rescheduling was required. The social/physical distancing was also applicable to other attachments and placements like community pharmacies and pharmaceutical industries.

Finally, on the assessment for and of learning, as per the guidelines by the PBM, most of the institutions converted their final examinations into online open-book-examinations or other assignments. A challenge faced by pharmacy institutions is the readjustment of questions for open-book-exams and to handle plagiarism and fairness in a non-proctored environment. Some of the high-stake or skills-based examinations such as OSCEs were conducted by using online applications and technology. Again, connection stability during online assessments is crucial, and this relates to the location and Internet package available.

In summary, while some flexibility has been given for T&L at pharmacy institutions in Malaysia, there are still some remaining challenges in assuring the learning outcomes and graduate readiness are not compromised as per programme standards.

2.4 Philippines

There are at least 104 universities and colleges registered in the Commission on Higher Education (CHED) for the Bachelor of Science (B.Sc.) in Pharmacy, mostly private and regulated by the Professional Regulation Commission (PRC) Board of Pharmacy, which sets the minimum standards on curriculum and internships to ensure eligibility to take the Pharmacy Licensure Examination (Commission on Higher Education, 2006; University of Santo Tomas, 2016b; Commission on Higher Education,

2018; Faller, Tolentino & Nagaria, 2019; Rosales, 2019; Professional Regulation Commission, n.d). Specialised undergraduate programmes such as the B.Sc. in Industrial Pharmacy (recently called B.Sc. Pharmaceutical Sciences), the five-year B.Sc. in Pharmacy (Major in Clinical Pharmacy), and the six-year Doctor of Pharmacy (Pharm.D.) are being offered (University of the Immaculate Conception, 2014; Centro Escolar University, 2015; University of Santo Tomas, 2016a; University of Santo Tomas, 2016c; UP College of Pharmacy, 2017). Moreover, the postgraduate two-year Master of Science in Pharmacy and 3-year Ph.D. in Pharmacy, delivered in mixed mode (coursework and research) with research specialisation, are also present. The implementation of the new Pharmacy law (RA 10918), the new CHED Memorandum Orders (CMOs) on Outcome-based education (OBE) in the pharmacy curriculum, and the national reform on basic education, K plus 12, aim to enhance competitively designed global quality standards in Philippine pharmacy education (Marcelo, 2014; Congress of the Philippines, 2016; Faller, Cruz-Bacayo & Abustan, 2016; Philippine Association of Colleges of Pharmacy, 2017).

Drastic changes in pharmacy education due to the COVID-19 pandemic resulted in the suspension of face-to-face classes at all levels, as well as activities including internships, as Higher Educational Institutions (HEIs) staff were directed to work from home (Commission on Higher Education, 2020a; Commission on Higher Education, 2020b). The didactic approach shifted to flexible learning blended with online, offline, residential, and non-residential school work, using digital platforms like Google classroom, Zoom, Edmodo, and other LMS (Faller et al., 2020; Panti, 2020). A nationwide descriptive cross-sectional survey, conducted on 280 students from different universities and colleges on the quality of pharmacy online learnings (QPOL) during the COVID-19 pandemic crisis, revealed that the QPOL were moderately effective (Faller *et al*., 2020). This means variable efforts must be concentrated on accessibility and a healthy balance for students to keep them abreast with the new normal in online learning. Best practices in pharmacy schools were identified, such as adaptability and the resilience of pharmacy faculties that engage more students amid crisis. Resource sharing among faculty and students, such as share-a-load and borrow-a-gadget schemes, shows 'bayanihan' or community spirit among pharmacy programmes. Finally, challenges identified were connectivity and resources, delivery and modalities that fit online learning, coping mechanism to online strategies that becomes an opportunity for self-directed learning and faculty enhancement and preparation that changes the paradigm of pharmacy education in the Philippines towards the new normal (Faller *et al*., 2020).

2.5 Mongolia

In response to the current pandemic, pharmacy schools in Mongolia have switched to provide online classes to the entire undergraduate and graduate students due to the several advantages it offers. Similarly, online learning has been promoted in pharmacy education to enhance student learning. The conventional classroom and textbooks are no longer the sole source of knowledge with the shift to present technological advancements. Currently, online learning classes (or e-learning) are fully delivered via the Internet or blended learning, which combines lectures through the Internet and periodic face-to-face meetings in a traditional classroom. It has been widely used for T&L in tertiary educational institutions, as it offers several advantages over didactic lectures.

Considering the most recent news and announcements from the World Health Organization (WHO) and the Government of Mongolia, a decision was made for the faculty members of the Mongolian universities to do their jobs remotely or work from home to ensure the safety of employees and students. Subsequently, entire pharmacy undergraduate and graduate classes were delivered online. Both staff and students were allowed extended sick leave and flexible schedules, as needed. These precautionary measures were taken to limit the potential spread of COVID-19 and to support students and employees in this challenging time.

E-learning follows the regulations of the Mongolian Law of Education and Health. The Mongolian National University of Medical Sciences (MNUMS) policy includes providing e-learning training, standards education technology and quality monitoring, pre-medical courses, policy for student assessment, and evidence and research-based online courses.

The use of digital media, video conferencing, virtual field trips or simulation, and social networking technology provides learning opportunities for students to engage in critical thinking and problem solving, creative expression, and communication. Students are able to access information and participate in T&L activities online at a convenient time, using portable devices including smartphones, laptops, and tablets. Each HEI independently organised distance learning using various online platforms and video conferencing software such as X cloud, Microsoft Office 365, Skype, Zoom, Google suite, Google

meeting, and Google classes. The Ministry of Education and Science established a "telephone e-education" service to answer questions and provide suggestions related to the educational processes, such as online courses, meetings, computer-based tests, online courses for the health professionals in rural areas, cooperation between local and international universities, and an e-learning cabinet equipped with modern technologies.

Within the first five months of the COVID-19 pandemic, the School of Pharmacy, Mongolia had 51 online subjects, 2,100 video lectures, 8,251 video conferences, 1,891 online classrooms with 378,802 files shared via its e-library, with 36,749 posts and 11,085 Facebook posts (https://www.facebook.com/groups/mnums.edu.mn/). A survey among the school of pharmacy's 546 students revealed that 56.8% owned personal computers, 42.6% smartphones, and 0.5% were using tablets. The school also used available facilities that have a multimedia studio for preparing online courses with high sound and video quality.

However, several problems affecting T&L were identified, including lack of Internet access in rural areas, low Internet server capacity, lack of face-to-face communication, cost of data plans for students, ensuring valid, reliable, and fair assessments, insufficient access or availability of e-textbooks, limited online student feedback, and instructors focusing more on theory rather than practice.

Some immediate solutions to resolve the challenges include zero-rating of educational websites for all students until the end of May by the Government and Telecom organisations supporting the cost of network operators. This service also provides free online teaching-learning platforms such as E-learning centre and Gmail, Google classroom cyber-learning services where teachers can set up an online classroom and post online assignments, surveys, and group instant messaging services for open class discussions and to track students' learning progress.

Students can get free access to zero-rated websites by applying through one of the three major Telecoms (Skytel, Mobicom, and Unitel). Also, students are supported with a discount of 50-70% for Internet data.

In e-learning, face-to-face communications were substituted with other methods of communication. For example, video chats, discussion boards, and chat rooms helped in dealing with the negative effects associated with a lack of face-to-face communication during online learning. Researchers have demonstrated successful examples of peer feedback systems in online learning, which provided a potential solution to the problem of limited student feedback in e-learning (Tamm, 2019). Additionally, this disadvantage of e-learning is sometimes solved through video chats with professors, which function similarly to the professors' office hours during on-campus training.

The university encouraged students as well as staff to continuously build strong self-motivation and disciplinary skills as the key to succeeding in an online learning environment. Students especially were able to get an education while studying from anywhere and anytime. Working from home while pursuing a full-time degree can save time and costs, further develop skills in information retrieval using the Internet and e-learning system as well as provide sustained and personalised attention from professors and classmates.

2.6 Indonesia

In Indonesia, the Bachelor of Pharmacy is a four-year programme. The graduates can continue to the pharmacist professional education programme for an additional one to 1.5 years. The programme is designed as a knowledge-based education, while the pharmacist professional-programme is based on skills and experiential learning. Following the pharmacist profession programme, students have to pass the national examination to become licensed pharmacists. This national exam consists of two types, namely the computer-based test (CBT) and OSCE. The CBT is conducted to evaluate the knowledge of students, while OSCE is used to assess the skills and attitudes (Ichikawa, 2007).

Similar to other countries, the Indonesian pharmacy education structure was affected by the global disruption wave of the Industrial Revolution 4.0, or the era of disruptive technology, defined as a state where individuals live, work, and interact with each other involving digital domains and innovative technology to enable and manage their lives (Schwab, 2016). Students were being prepared for the future challenges and as change agents, involving the mobilisation of knowledge, skills, attitudes, and values to meet complex demands, involving three main competencies or literacies, i.e., human, technology and data (OECD, 2018); Cazarez & Aoun, 2020).

The readiness for this change was challenged when the COVID-19 pandemic spread to Indonesia on 2nd March 2020. Subsequently, the Indonesian government declared the pandemic a national disaster and issued policies for working from home, including T&L activities. Universities' academic policies related to the emergency response period included replacing all educational activities on- and off-campus with online activities, consultation, and examination activities, and cancelling any academic

activities involving many people (e.g. graduation ceremonies, conferences, etc.).

Before the pandemic, some faculty members already underwent serial training for blended learning but actual implementation was minimal. However, the pandemic resulted in the immediate development of programmes to train academic staff in using synchronous and asynchronous T&L facilities. Some universities provided hotline services for online learning. This approach proved to be effective based on the feedback from students and lecturers through an online survey. A total of 304 respondents from Universitas Gadjah Mada (UGM), for example, found that only 24% of students faced no significant problems during online learning activities; 35.9% had problems with the Internet signal, and 28% had limited Internet quota.

At the UGM, the strategy to transform T&L from March to July 2020 was conducted in three phases. The emergency phase started from day one of lockdown, while the acceleration phase began after the midterm phase up to the final exam. This phase compressed the duration of the T&L period into half due to Islamic festive celebrations. The wash-out phase started after the final exam up to the announcement of the final grade. T&L for the next academic calendar up to November 2020 will be conducted online. The Pharmacy faculty has scheduled a crash course for lab skills in January 2021 for graduating students to fill in the potential competency gap which cannot be fully achieved through an online approach.

T&L facilities used for synchronous methods included Cisco Webex, Zoom, Microsoft teams, Skype, and Google Meet. Social media platforms such as Instagram stories, WhatsApp, etc., while for asynchronous methods the university has provided eLisa (eLearning System for Academic Community), which was designed for simple tasks in the facilitation of online learning, and eLok (eLearning: Open for Knowledge Sharing), a Moodle-based platform prepared for Massive Online Open Courses. Furthermore, the faculty has provided department-based e-learning. Some lecturers chose other asynchronous methods by using e-mail, Google classroom, and other media. Results from an online survey conducted at the UGM showed that 77.3% T&L was conducted synchronously via video conference, 44.6% via social media and 36.6% via LMS (PIKA UGM, 2020a). Results of the online survey covering the midterm and final examinations showed that most pharmacy students considered asynchronous T&L as more convenient for assessment than synchronous T&L (PIKA UGM, 2020b).

Following the first two phases of the above-described transformation, the faculty and the university conducted an online survey to evaluate the students' feedback on T&L as well as the lecturers' preferences. Results demonstrated that 83.4% of students perceived the online learning material delivery as sufficient to very good while the learning material comprehension online was observed as adequate by 66.9% of respondents (sufficient to very good) (PIKA UGM, 2020a).

The Faculty had to prioritise laboratory facilities for master's and doctoral degree research activities. The bachelor students were advised to collect secondary data or use online surveys or interviews. Alternatively, final assignments were switched to narrative, evidence, or systematic reviews. All examinations and consultations with supervisors were conducted online.

The most challenging situation was related to the experiential learning approach for students on the professional pharmacist programme. All students in the second semester of the programme must undergo an internship in a pharmacy at the primary healthcare facility. At the same time, hospital and pharmaceutical industry internships were offered as electives. All internship partners cancelled placements starting from March 2020. Therefore, the method of delivery was modified during the pandemic. Content sharing methods included videos and presentations of some practical work in industries, pharmacies, hospitals, and health centres, followed by discussion groups involving field supervisors, preceptors, or practitioners. The discussion groups were arranged in such a way that students who had completed their experiences in the respective field of internship were able to share their experience with others.

Discussion

Pharmacy educators in the Asia-Pacific Region are primarily concerned about adapting their teaching and evaluation methods to the unique situation brought about by the pandemic. The use of synchronous and asynchronous e-learning tools, which used to be considered innovative or supplementary, has now become the most important if not the only way for most educators to continue their teaching and assessment activities. This sudden transition has pushed a lot of institutions to use strategies which have never been tried before in order to meet the required development of necessary skills and competencies among pharmacy undergraduate and graduate students, such as laboratory,

clinical, research, and other practical skills. The need for educators to learn new skills quickly and use untried methods are leading to apprehensions about the possible impact on the quality of teaching and attainment of educational outcomes. Fortunately, there are now many platforms, tools, and innovations to choose from, depending on the specific needs in education. It is imperative that pharmacy educators collaborate and learn from each other during these extraordinary circumstances. Ultimately, the use of technology in pharmacy T&L will lead to a new era whereby the best practices used by faculties will be available from across the globe to the students. Education quality will be gauged not just by the quality of a faculty, but will also have the quality of IT infrastructure and the familiarisation of the faculty with digital teaching technologies as important parameters.

Adapting quickly to the changing nature of the educational environment during the pandemic is challenging and demanding for all stakeholders of academic institutions, including administrators, pharmacy educators, staff, and students. The crisis has led many to feel uncertainty and difficulty when deciding whether institutions should defer some classes until they can be held again in normal face-to-face settings or embrace the risks of new methods as the new normal in education. The experience of some countries in the Asia-Pacific Region shows that support in terms of policy and guidelines within institutions, as well as on the national level, reduces uncertainty for many. It further lets educators and students focus on preparing for the transition and finding the needed solutions for the challenges they face during implementation.

One of the greatest challenges in the adoption of new skills and technology to move pharmacy education forward are the inequities faced by institutions, faculties, and students. Socio-economic and IT infrastructure conditions are commonly mentioned as important considerations in the selection of technology and methods of teaching. While technological skills development can easily be provided by institutions, individual limitations such as a lack of equipment and insufficient Internet connectivity are a barrier that is generally difficult for academic institutions to address directly. Therefore, institutions must first determine the needs of both educators and students before they choose the most feasible and suitable strategies to attain their goals. Some countries in the Asia-Pacific Region show model interventions from the government, as well as voluntary initiatives by private groups to help reduce the burden from these inequities.

Even with all the efforts of multiple stakeholders in pharmacy education, the effect of the pandemic on the safety, coupled with the remote learning set-up, still makes people uncomfortable amidst uncertainties and questions that remain difficult to answer. Whether academic institutions can consider the needs of all their constituents, if students can be trusted to learn everything remotely, or if faculty members can assess students effectively may remain unanswered in the coming months or years, until institutions have tested all the possible ways to adapt to the unique circumstances affecting pharmacy education.

Conclusion

There are similarities in the challenges faced in many countries in the Asia-Pacific Region brought upon by changes resulting from the COVID-19 pandemic. Various experiences from different countries provide insights into possible interventions and even opportunities to help address the growing concerns of pharmacy educators across the region. Clearly, as further developments occur, there is a need to continue collecting regular feedback from students and staff to improve T&L activities. Besides facilitating the availability of more convenient online platforms and facilities for both students and staff, the higher education management should also consider the social and economic impact of the T&L changes. Universities should provide support to ensure the sustainability of the pharmacy education process and work together with governments and other stakeholders to increase resilience in the face of crisis. Challenges in the so-called "New Normal" with regards to living side-by-side with the pandemic should trigger more innovative, agile, and flexible approaches in the T&L models and tools. This uncertain, complex situation, while difficult for many, can still be taken as an opportunity to drastically transform the mindset toward optimising the digital technology for preparing pharmacy students and staff with adaptability to the Industrial Revolution 4.0 and beyond.

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