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Original article

Strategic job market-guided development of pharmacy bachelor's curriculum and its importance in maintaining the profession viability in the Middle Eastern countries: Colleges of pharmacy in the UAE as a model

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ABSTRACT

The Middle East has high youth population; however, it is challenged by uncertain economic situation. Higher education plays a crucial role in the development of nations by equipping generations with the knowledge and skill through cumulative curriculum development. Like other professions, pharmacy is a dynamic field of study where continuous improvements are required to keep the viability of the profession and endow future generations with up to date skills. This article describes a strategy for pharmacy curriculum development considering four layers. The strategy starts from the understanding of the current situation in a university, looking into national, international accreditations and job market. The strategy covers development from program to subject's level. The strategy is applied to pharmacy programs in the UAE. Upon analysis, several recommendations were obtained for curriculum improvements. At individual university level, there is a need to work on clinical oriented topics in the curriculum to fit with international accreditation and country's vision. Details on this can be taken from deeper analysis of job market and stakeholders in the UAE. On the national level, unifications of total credit hours for the degree across universities needs to be envisaged with limits on contact experiential hours. The strategy has the potential of extrapolating to other Middle Eastern countries.

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Abbreviations: MENA, the Middle East and North Africa region; UAE, United Arab Emirates; MoH, Ministry of Health and Prevention; MoE, Ministry of Education; CAA, the Commission for Academic Accreditation; CCAPP, Canadian Council for Accreditation of Pharmacy Programs; PLOs, Program Learning Outcomes; GMU, Gulf Medical University; RAK, Ras Al-Khaimah Medical University; ACPE-ISP, Accreditation Council for Pharmacy Education - International Services Program; ACPE, Accreditation Council for Pharmacy Education; HCT, Higher Colleges of Technology; C.H., Credit Hour; SOPs, Standard Operating Procedures; UK, United Kingdom; BPharm, Bachelor of Pharmacy; APC, Australian Pharmacy Council.

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1. Introduction

1.1. Pharmacy education and society

Medical, and health sciences including pharmacy are rapidly evolving, requiring universities across the globe to continually update both the contents and the design of their courses to keep abreast of progressing technologies and advancements (Jackson, 2016). Concurrently, higher education has a duty to facilitate the development of transferable skills, as well as, subject-specific vocational skills, and job related knowledge, therefore, enhancing graduate employability (Nägele and Stalder, 2017). The term “employability” is not only limited to securing jobs, but is more of improving adaptability and developing skills to be fit for the job responsibilities (Small et al., 2018). Successful degree delivery, combining both transferrable and professional core skills, and building job-related knowledge, requires a proper understanding

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of the current approaches to course design and development and a clear vision of the professional skills required in the graduate job market.

1.2. Strategies for development of pharmacy curriculum in developing countries

Pharmacy related educational studies discussed the development of specific aspect in pharmacy curricula like the use of integrated degree design and investigated to which extent Harden ladder should be achieved (Harden, 2000; Husband et al., 2014). Others focused on incorporation of clinical skills in the curriculum (Hussain et al., 2017). Khan et al described a harmacy curriculum development and validation model aimed to improve pharmacy education in Asian developing countries However, there was no comparative analysis of the proposed model nor application of it to any national case (Khan et al., 2011). Several short viewpoints and letters to the editor covering pharmacy curriculum development in the developing world emphasized on the need to consulate not only international guidelines but also national vision for the profession (Hassali, 2011; Khan, 2010). Focusing on the middle east, the region is part of what can be called developing countries, but it has distinct feature compared to developing African countries in terms of job market. In many of the developing countries, working pharmacists are scarce,while in the middle east, the region has high mean percentage in density of pharmacists (per 1 000 population) with relatively large differences in economic situation among countries of the region. For that reason, the focus is on improving the quality of the graduates (Bhuvan, 2018). Consequently, for the middle east region, there is no previously described strategy for overall curriculum development and especially guided by improving quality of practice taking into account national vision and job market dynamics altogether.

1.3. Job market-guided development of pharmacy bachelor's degree programmes curriculum strategy

Pharmacy degree design is a dynamic process as the presented strategy propose (Fig. 1). Each university can make its own vision of the profession to reflect its own research orientation, country strategic plans and market contextualisation. This is reflected as 'layer 1' in our proposed strategy (Layer 1; Fig. 1). Universities can orient their design to capture an area of emergence, novelty, or certain immediate need from social point of view. The pharmacy

degree design within the country should be in harmony with the central policies of the country. The roles of local accrediting body, the Ministry of Education (MoE), is considered (Layer 2; Fig. 1). Widening the programme scope further beyond the country to worldwide recognized best practices in pharmacy education could be used to achieve informed reform of the pharmacy profession (Layer 3; Fig. 1). Finally, completing the circle by going to job market to help universities gather the key skills required for pharmacists in different working places. This strategy will ensure that pharmacy programs are not prototypic and copies of each other across global universities but aligned across the country with key objectives at program level and up to date content in reflection of the county vision, needs and job market. In our proposed strategy, program change starts at the university level, goes up to institutional levels in the country then down again to pass through colleges of pharmacy and curriculum delivery team that will restructure the detailed learning outcomes in the individual subjects by introducing a new set of skills or designing a new assessment tool, all of that is guided by the job market. In this article, we applied this strategy to the United Arab Emirates (UAE) colleges of pharmacy as a model country in the Middle East region. The ultimate aim is that the outcomes of this strategy could be extrapolated to other developing countries around the world.

1.4. The case of United Arab Emirates (UAE)

The UAE has one of the largest economies in the Middle East and North Africa region (MENA). According to the United Nations data, UAE population (in 2021) hits 9.99 Million ("UAE Population Statistics 2021 (Infographics) | GMI," 2021). The majority of the population are young in the age group from 25 to 54 years old (6.6 million), while the younger age groups from 15 to 24 years old constitutes 1.17 million ("UAE Population Statistics 2021 (Infographics) | GMI," 2021). However, being in a strong economic rank and surrounded by other 14 countries in the Middle East region, where the unemployment rate is as high as 27.2%, makes the UAE a professional destination for many expatriates especially pharmacists and other healthcare providers (Assaad and Krafft, 2016; Oxford Business Group, 2016). The UAE is a constitutional federation of seven states (emirates) that was established in 1971. UAE nationals constitute around 11% of the total population, making the UAE home to one of the world's highest percentage of expatriates (The Official Portal of the UAE Government, 2018). This encourages pharmacists from countries like Jordan, Syria, Philip-

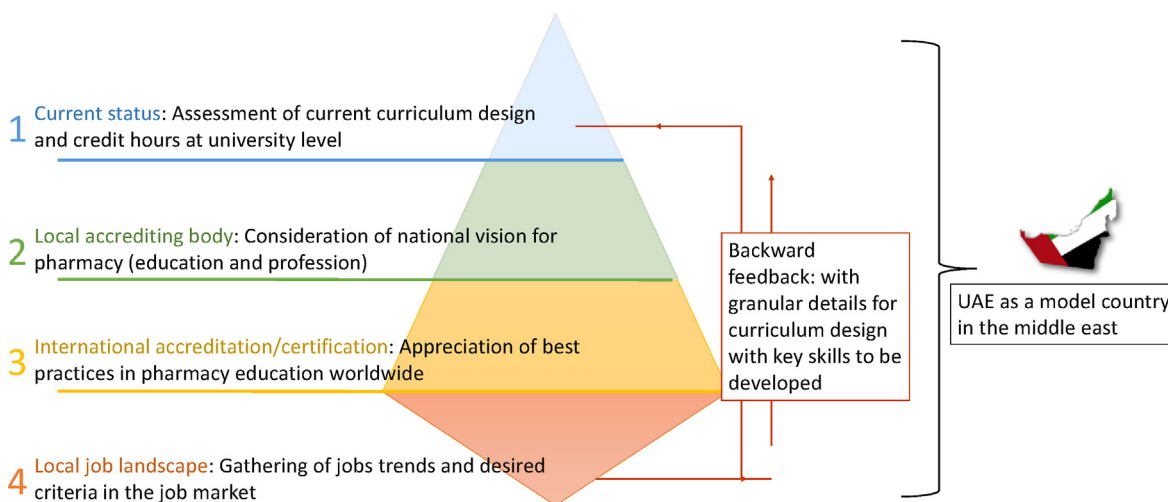


Fig. 1. The four layers of the proposed strategy for curriculum evaluation and development chart.

pires, and Pakistan to seek jobs in the UAE due to lack of opportunity in getting such jobs in their home countries. Others are aiming for higher income compared to their home countries (Kheir et al., 2008). This has placed the practice of pharmacy under challenges of not only overlooking the non-national certified pharmacists practising in the country but also shaping the future of the profession in the UAE.

As generally trending worldwide, the pharmacy profession in the UAE –is advancing in terms of providing greater involvement in clinical practice, and more valuable patient consultation (Al-Ghananeem et al., 2018). This process is gradual and necessitate crucial change, both in the perception of the role of the pharmacist by other healthcare professionals and the public, and also in the provision of pharmacy education to meet the growing needs of a dynamic and changing profession (Abu-Gharbieh et al., 2010). The change in perception is already apparent, with medical college students and physicians in the UAE believing that, clinical pharmacists are an important part of the clinical healthcare team. In a study, by Abu-Gharbieh et al in 2010 involved 535 participants (265 healthcare providers including 103 pharmacists, and 270 medical students). A validated questionnaire was used to ask the participants about their perception in whether the clinical pharmacists in the UAE have fulfilled their role. Data showed that only 25% of the physicians, 27% of the pharmacists, and 35% of nurses, agreed with this statement (Abu-Gharbieh et al., 2010). This study highlighted the medical appreciation of clinical pharmacy input, and the perception that pharmacists could make a greater contribution in their roles. In another study, which involved final year pharmacy students, results showed that 47% of the respondents did not perceive a relationship between what they studied and the reality of practice of pharmacy, while after graduation, 60% indicated that their experiential training course did not meet their expectations (Abduelkarem and Hamrrouni, 2016). These studies suggest the benefit from working on pharmacy education in the UAE to ensure that pharmacy graduates are equipped to make a valuable contribution to patient care.

This article aims to propose a strategy to update pharmacy curriculum using current situation, national and international accreditations and job market dimension in the developing countries using the colleges of pharmacy in the UAE as a model. The findings may be of value to support education experts and decision makers in pharmacy education across other Middle East countries or institutions that are planning to strengthen the role of pharmacists in their societies.

2. Methods

2.1. Acquiring information about pharmacy education and legislation in the UAE

All colleges of pharmacy across the UAE that offer a BPharm degree (which has had at least one graduating cohort) were included in the current study. The main source of information regarding curricular content was collected from the websites of the included colleges of pharmacy. All analysed curricula were for the 2019/20 and 2018/19 academic years, in case that university website was not updated with current academic year, the most up to date version was used. Only universities with published programme learning outcomes (PLOs) online were included in the analysis (Fig. 1 layer 1).

Websites such as Ministry of Health and Prevention (MoH) was also searched to collect information regarding the pharmacy profession, regulation, statistics, and workforce in the UAE (Ministry of Health and Prevention, 2020). Other publications of government-

tal and non-governmental bodies were reviewed for population-related data, such as population growth, number of hospitals, and community pharmacies etc.; these have been referenced when used (Department of Health (Ministry of Health, 2017; F, 2018; The Official Portal of the UAE Government, 2018).

2.2. Assessment of learning outcomes of the pharmacy programmes and national criteria for accreditation

Programme Learning Outcomes (PLOs), the statements that describe the knowledge or skills students should acquire by the end of program (Tor, 2022). Online published pharmacy program PLOs by all UAE universities were classified by the strands of the Commission for Academic Accreditation (CAA) UAE national accreditation framework (Fig. 1 layer 2) (Commission for Academic Accreditation Ministry of Education, 2019a).

2.3. Assessment of curriculum contents of colleges of pharmacy in the UAE

The CAA guidelines for higher education programmes are not subject-specific. Therefore, to enable a common baseline for comparison between curricula of the colleges of pharmacy in the UAE through comparing credit hours for each section (Fig. 1 layer 3), the syllabus of the BPharm programmes in the UAE were classified under six headings. These have been constructed with reference to the Canadian Council for Accreditation of Pharmacy Programs (CCAPP) (Dan, 2019; The Canadian Council for Accreditation of Pharmacy Programs, 2019). The CCAPP was selected as being the most comprehensive with clear borders. The categories are as follows:

1. **General education courses:** such as languages, education, history, art, and sciences other than health courses.
2. **Biomedical sciences:** courses including Biochemistry, Biostatistics, Human Anatomy, Human Physiology, Immunology, Microbiology, and Pathology.
3. **Pharmaceutical sciences:** courses including Medicinal Chemistry, Pharmaceutics, Pharmacogenomics, Pharmacokinetics, Pharmaceutical Analysis, Pharmaceutical Technology, Pharmacognosy, Natural Products, Biotechnology, Pharmacology, and Toxicology.
4. **Social/behavioural/administrative and clinical sciences** courses, including: Healthcare Systems, Pharmacy Law and Ethics, Public Health, Pharmacoepidemiology, Pharmacoecconomics, Social Pharmacy, Practice Management, Pharmaceutical Marketing, Pharmacotherapeutics, Clinical Pharmacy, Patient Safety Practices, Health Informatics, and Self-Care Pharmacotherapy.
5. **Practice skills** – work placements, primarily in community and hospital pharmacies, but may also include Pharmaceutical Industry.
6. **Graduation project**, which could include topics from any of the above sections, except the elective courses and professional experiential placement sections.

The CCAPP was taken as it is for categories 2, 3 and 4, while the category 1 was taken based on BPharm curricula in the UAE that contain general sciences courses. Finally, categories 5 and 6 were defined based on the great emphasis of practice experiences and development of self-learning attitudes among students.

Subjects were allocated to each category based on the subject title containing any of the above-mentioned key words. In case of subjects, which don't have any matching words in the title, a

further analysis of the subject description was performed. Two independent allocations were carried out by authors and agreement were pursued for subjects that has been assigned to different categories by authors.

2.4. Evaluation of pharmacists employment in the UAE

To understand the main requirements for a graduate pharmacy job in the UAE, Google® and LinkedIn® were used to collect graduate job advertisements in several areas of pharmacy job market. Job advertisements under the title of registered community pharmacist, hospital pharmacist, medical representative, regulatory affairs officer, and pharmaceutical or medical store that were published between 1st June 2020 – 31st December 2020, using the UAE as a location for these positions, were included in the study. The search was limited to the aforementioned key words without any variation. One-hundred job announcements were taken covering 20 announcements from each job title. Job advertisements were randomly selected using a systematic sampling method: number 5 in the list of each job title announcements was selected and a list of written skills was extracted.

2.5. Inclusion and exclusion criteria for assessed documents

Inclusion criteria for the selected websites were (i) being the official websites of the universities or the government, (ii) being published in either Arabic or English language, (iii) has a date showing the last update on the website. For job market analysis, only jobs that has the exact same wording on the job title were selected. Exclusion criteria were incomplete articles or documents that did not clearly state the name of the university and the taught program. Documents that lack a date of publication. Or documents not directly hosted on the university or government websites. For job market analysis, jobs that did not provide both essential and desirable criteria in the job description were not included in the study.

3. Results

3.1. Current BPharm programmes in the UAE (Layer 1)

Currently, at undergraduate level, there are 10 accredited colleges of pharmacy across the UAE. 7 colleges offer Bachelor of Pharmacy (BPharm) degree, and 1 college offers a Doctor of Pharmacy (PharmD) program (Table 1). All pharmacy programmes are taught in English language; therefore, English proficiency score is required from all students. In addition, all graduates are expected to be able to practice pharmacy in the UAE after graduation then passing the licensure examination.

3.2. Learning outcomes of the BPharm programmes and national criteria for accreditation (Layer 2)

In contrast to the majority of developed countries, where the regulation of initial pharmacy education is the responsibility of pharmacy regulators, pharmacy education in the UAE is accredited by the CAA. This is a multidisciplinary accrediting body that covers wide range of programmes in its scope, and therefore does not provide pharmacy-specific accreditation (Alkhateeb et al., 2018). It issues a national qualifications framework for educational programmes across various disciplines and levels. This framework defines key standards for each level of study, categorised under three strands, with the 'Competence' strand further divided into three sub-strands (Commission for Academic Accreditation Ministry of Education, 2019a):

- I. Knowledge (K)
- II. Skills (S)
- III. Competence (C)
 - C1: Autonomy and responsibility.
 - C2: Role in context.
 - C3: Self- development.

These 3 strands are intended to facilitate the development of programmes learning outcomes in alignment to the National Qualifications Framework of the UAE. PLOs must be designed in line with these strands (Commission for Academic Accreditation Ministry of Education, 2019b). However, the emphasis placed on each strand is expected to vary between individual programmes, with some placing a stronger focus on knowledge and skills and others concentrating more on competencies (Commission for Academic Accreditation Ministry of Education, 2019a). The CAA framework includes teaching and assessment pedagogy, course and programme-level learning outcomes, programme evaluation, and quality assurance. All official colleges of pharmacy in the UAE have national accreditation from the CAA.

3.3. Analysis of BPharm programmes and international criteria for accreditation (Layer 3)

In addition to the CAA framework, international accreditation initiatives such as the Accreditation Council for Pharmacy Education - International Services Program (ACPE-ISP) have been used by several UAE universities in their aim to develop their curricula and improve their competitive position in the country (Alkhateeb et al., 2018). 2 BPharm programmes have international ACPE certification (i.e. Ajman University and Al-Ain University) and only 1 PharmD. programme (i.e. Gulf Medical University). On the other hand, 2 pharmacy programmes were initially affiliated with the Faculty of Pharmacy and Pharmaceutical Sciences at Monash University, Australia, i.e. the pharmacy programme of the University of Sharjah (applied in 2004) and Fatimah College of Health Sciences (in 2011). However, these programmes have no accreditation from the Australian accreditation committee. Consequently, and to avoid bias besides to being comprehensive, the Canadian Accreditation Guidelines for International Programs CCAPP were used to in analysis of programs design and content allocation.

3.3.1. Pharmacy undergraduate programs design

All BPharm programmes offered in the UAE universities follow semesters credit hour model. The number of credit hours varies considerably between colleges, ranging from 133 to 177 credit hours (Fig. 2). Consequently, the study period ranges from 8 to 10 semesters, excluding the summer term. The minimum length of study was 4 years in 4 universities (i.e. RAK, HCT and Dubai pharmacy college), 4.5 years (nine levels) at Al-Ain University and Ajman University, 5 years in the University of Sharjah and Fatima Colleges of Health Sciences, showing between half to a full year of difference in programme length, despite all being accredited by the CAA.

As described in the available online BPharm programme brochures for the academic year 2019/20 (Al-Ain University, 2021; College of Pharmacy and Health Sciences of Ajman University, 2020b; Dubai Pharmacy College for Girls, 2021b; Higher colleges of technology, 2021; University of Sharjah, 2021c; University, 2020), some programmes offer the topic of pharmacy practice only in the third year of study (4 years programme length) while at other universities, the topic is offered from the beginning of the second year (5 years programme length). This indicates that the time devoted to practice-related topics may vary considerably between programmes. The term "Clinical" was apparent in most programmes from the second year of study but was linked to chemical aspects of human life, which differs from the Cambridge

Table 1

A summary of pharmacy colleges offering pharmacy education in academic year 2020/2021 in the UAE and has graduated cohorts^c.

University name	Year established	Current program*	GSC Admission requirements	City	Total number of credit hours
Dubai Pharmacy College for Girls (DPC) (Dubai Pharmacy College for Girls, 2021a)	1992	Bachelor of Pharmacy	A minimum High School Average of 85% for Advanced Track or 80% for Elite Track or equivalent in Standardized International Systems	Dubai	160
Ajman University(AU) (City University College of Ajman, 2020) ^a	1996	Bachelor of Pharmacy	A minimum High School Average of 85% or 80% Standardized International Systems.	Ajman	160
Higher Colleges of Technology (HCT) (Higher School of Technology, 2021)	1997 (Diploma);2003 (Bachelor)	Diploma of Pharmacy Bachelor of Pharmacy	Minimum High School average (GSC) = 85%	Dubai	139
University of Sharjah (University of Sharjah, 2021a)	2004	Bachelor of Pharmacy	Minimum average of 80% in the GSC; 90% and above are accepted immediately and students with 80–89% are registered on a waiting list.	Sharjah	170
Al-Ain University (Al Ain University, 2021)	2006	Bachelor of Pharmacy*	Minimum average of 85% (Science/advanced) or 80% for Foreign Secondary Certificate (British/American) OR Elite.	Al-Ain and Abu Dhabi	160
Ras Al-Khaimah Medical University (RAK) (Ras Al-Khaimah Medical University, 2021)	2007	Bachelor of Pharmacy	A minimum High School Average of 85% for Advanced Track or 80% for Elite Track or equivalent in Standardized International Systems	Ras Al-Khaimah	133
Gulf Medical University (University, 2021)	2008	Doctor of Pharmacy* PharmD.	Minimum score of 85% in the High School	Ajman	200
Fatima College of Health Sciences (Fatima College of Health Sciences, 2021) ^b	2011	Higher Diploma of Pharmacy Bachelor of Pharmacy	A minimum High School Average of 80% for Advanced Track or 85% for Standardized International Systems	Abu-Dhabi	160
City University of Ajman (City University College of Ajman, 2021)	2019	Bachelor of Pharmacy	Minimum GSC 85%	Ajman	150
University of Science and Technology of Fujairah (Fujairah, 2021)	2019	Bachelor of Pharmacy	Minimum High School Average of 85% for Advanced Track or 80% for Elite Track or equivalent in Standardized International Systems.	Fujairah	166

* This programme has been granted Certification by the Accreditation Council for Pharmacy Education (ACPE), USA.

^a Ajman University – new pharmacy curriculum is 160C. H instead of 150C.H with old curriculum that started in 2019–20, and with no graduation yet.

^b Fatima College of Health Sciences – new pharmacy programme is 160C.H started in 2019–20 with no graduation yet (Fatima College of Health Sciences, 2021).

^c University of Science and Technology of Fujairah –has no graduation yet (Fujairah, 2021).

Table 2

Number of the PLOs distribution according to the strands of learning outcomes of the Commission for Academic Accreditation (CAA) of the UAE colleges of pharmacy.

Name of the College/University	KnowledgeN (%)	SkillsN (%)	Competences N (%)			Total no. (%)
			Autonomy and responsibility	Role in content	Self-development	
^{**} Higher Colleges of Technology (Higher School of Technology, 2021)	2.0 (28.6)	2.0 (28.6)	1.0 (14.3)	1.0 (14.3)	1.0 (14.3)	7.0 (100.0)
[*] Dubai Pharmacy College for Girls (Dubai Pharmacy College for Girls, 2021b)	3.0 (33.3)	3.0 (33.3)	1.0 (11.1)	1.0 (11.1)	1.0 (11.1)	9.0 (100.0)
[*] Ajman University (College of Pharmacy and Health Sciences of Ajman University, 2020a)	3.0 (25.0)	4.0 (33.3)	1.0 (8.3)	3.0 (25.0)	1.0 (8.3)	12.0 (100.0)
[*] Al-Ain University (Al-Ain University, 2021)	2.0 (18.0)	4.0 (36.0)	1.0 (9.0)	2.0 (18.0)	2.0 (18.0)	11.0 (100.0)
[*] University of Sharjah (University of Sharjah, 2021b)	5.0 (35.7)	3.0 (21.4)	2.0 (14.3)	2.0 (14.3)	2.0 (14.3)	14.0 (100.0)
[*] Gulf Medical University (University, 2021)	5.0 (29.4)	5.0 (29.4)	2.0 (11.8)	4.0 (23.5)	1.0 (5.8)	17.0 (100.0)
[*] Ras Al-Khaimah Medical University (Ras Al-Khaimah Medical University, 2021)	7.0 (31.8)	9.0 (40.9)	2.0 (9.0)	2 2.0 (9.0)	2 2.0 (9.0)	22.0 (100.0)

^{*} Private.

^{**} Governmental.

definition of clinical being “used to refer to medical work or teaching that relates to the examination and treatment of ill people” (Cambridge English Dictionary, 2021). In some programmes, the word ‘clinical’ was not part of any course title but appeared as described by Cambridge definition in the some courses such as the graduation project within Professional Practice Experience and Drug Information & Literature Evaluation (total 10C.H.) (Ajman University, 2021; College of Pharmacy and Health

Sciences of Ajman University, 2020b) or appeared in courses only in the fourth year of the programme (5 years program length (Fatima College of Health Sciences, 2021).

3.3.2. Pharmacy undergraduate program contents allocation

Essentially, all the pharmacy curricula include foundation and health sciences in the first year, while basic and advanced pharmacy subjects: pharmaceuticals, medicinal chemistry, pharmacol-

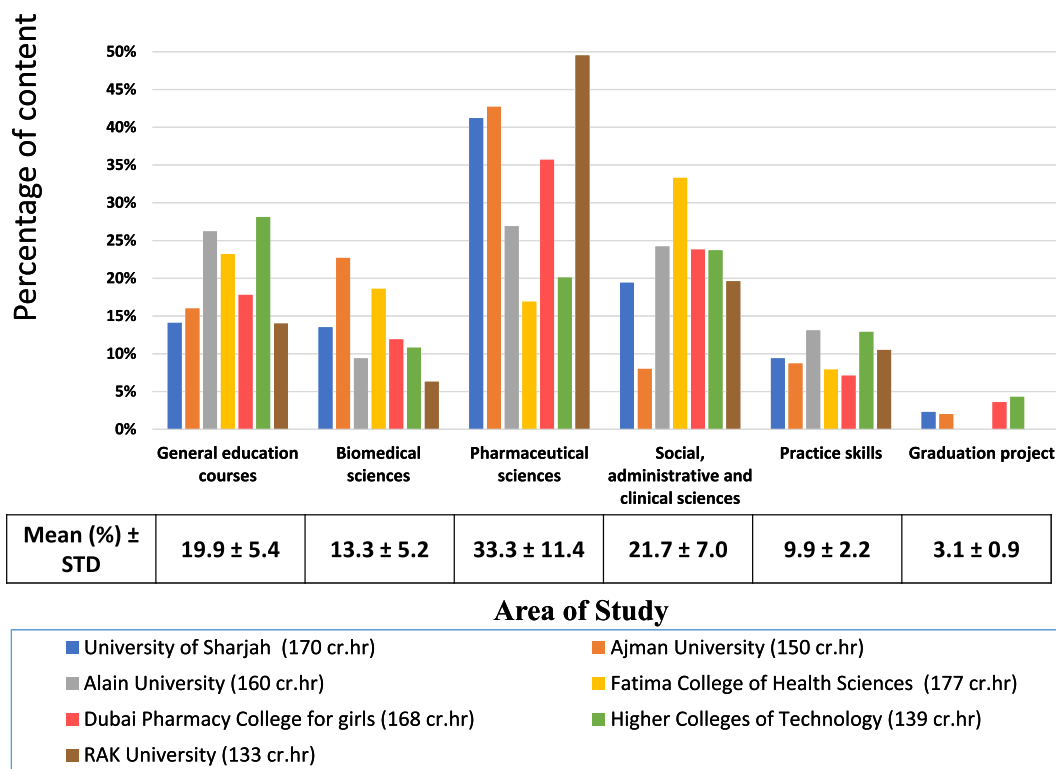


Fig. 2. Comparison of the BPharm pharmacy programme's contents in percentage of seven universities based upon the six headings defined in Section 2.3.

ogy, pharmacokinetics, clinical pharmacy, and applied therapeutics, as well as pharmacy practice, are taught in the later years. To enable ease of comparison between universities, BPharm programme content was classified based on headings defined in Section 2.3 (Fig. 2). This demonstrates clear variations in the distribution of programme contents.

The available online BPharm programme brochures for the academic year 2019/2020 in different universities (Al-Ain University, 2021; College of Pharmacy and Health Sciences of Ajman University, 2020b; Dubai Pharmacy College for Girls, 2021b; Higher colleges of technology, 2021; University of Sharjah, 2021c; University, 2020), shows that the main focus of several BPharm programs was on the Pharmaceutical Sciences related courses. Furthermore, several credit hours of and general education courses covers more than 50% of the total degrees on average. The term ‘Therapeutics’, which broadly means according to Britannica “Serving and caring for the patient in a comprehensive manner, preventing disease as well as managing specific problems” (Robert Edwin Rakel, 2021), was used to describe courses in most of the programmes. In some programmes, a course containing the title “Therapeutics” contributes to 9 (College of Pharmacy and Health Sciences of Ajman University, 2020b), 12 (Dubai Pharmacy College for Girls, 2021b; Higher colleges of technology, 2021) or 16 credit hours (University, 2020) of the total programme credit hours, which corresponds to being covered in three to five courses. Some universities starts the topic in the second or third year of the study (College of Pharmacy and Health Sciences of Ajman University, 2020b; Dubai Pharmacy College for Girls, 2021b; University, 2020) and (Al-Ain University, 2021; Higher colleges of technology, 2021).

3.4. Pharmacy job market in the UAE (Layer 4)

According to the Federal Competitiveness and Statistics Authority, Table 3 shows the significant change in the number of newly

Table 3 Number of key health facilities in the UAE difference between 2010 and 2015 (The Federal Competitiveness and Statistics, 2020).

Pharmaceutical organization	Number of facilitates		Differences in No. (%)
	2010	2015	
Private pharmacies (community)	1481	2304	823.0 (35.7)
Private Hospitals	104	126	22.0 (17.5)
Pharmaceutical Industries	13	16	3.0 (18.8)
Pharmaceutical distribution stores	241	261	20 (7.7)
Scientific offices	23	47	24.0 (51.1)

launched hospitals, private/chain pharmacies, pharmaceutical industries and scientific offices between 2010 and 2105 in the UAE. The table also shows the percentage associated with this increase.

Table 4 summarises the knowledge and skills requirements stipulated in pharmacy job advertisements form different sectors, which were posted between June-December 2021. Key skills requested by employers in 100 job announcements for community pharmacist, hospital pharmacist, medical representative, regulatory affairs officer, and store pharmacist were gathered. Table 4 lists the skills that were included in more than 75% of searched announcements. Other skills, for example, appreciation of quality standards and SOPs, understanding of medical insurance system in the country, accountability and numeracy were mentioned in less frequency (less than 75%) of announcements but were also included to highlight their importance in pharmacy profession.

4. Discussion

The main goal of pharmacy is patient care (Kehrer et al., 2013). Within hospital and community settings, pharmacy priorities are to provide advanced patient consultation and follow-up, and better

Table 4
Job title announcement and their knowledge and skills requirement for the job.

Job title announcement	Required knowledge and key skills
Pharmacist for Community Pharmacy	<ol style="list-style-type: none"> 1. Knowledge-based skills: knowledge of drugs, their side effects, and their interactions to provide consultancy to patients 2. Communication skills with physicians and patients 3. Ability to supervise pharmacy workers and follow-on drug in-store preparation
Pharmacist for Hospital Pharmacy	<ol style="list-style-type: none"> 1. Skills mentioned in community pharmacy were also present among hospital pharmacy jobs investigated 2. The ability to write drug use guidelines 3. Ability to advise on formulation alternatives for in-hospital prepared drugs.
Pharmaceutical Company – Medical representative	<ol style="list-style-type: none"> 1. Distribute knowledge using guidelines through product samples, marketing literature, clinical trials related to products to help physicians and other healthcare professionals make the best decisions. 2. Good communication and presentation skills when contacting physicians and other healthcare professionals
Regulatory Affairs officer	<ol style="list-style-type: none"> 1. Understanding the local system of drug marketing and authorization 2. Outlining requirements for labelling, storage, product leaflet and packaging 3. Verbal communication skills
Pharmacist for a Pharmaceutical Store	<ol style="list-style-type: none"> 1. Supervision over the organization, storage, handling and dispensing of pharmaceutical products

treatment adherence achieving better prognosis. Incorporating these values with the associated core knowledge is the ultimate target in the design of pharmacy curricula (Jamshed et al., 2007). To meet the social value, colleges of pharmacy are working towards contributing to the health sector in the country by producing skillful graduates. Ten universities across the UAE offers a BPharm degree to both genders across the whole country for a population of approx. 10 million (Table 1) (“UAE Population Statistics 2021 (Infographics) | GMI,” 2021), which looks roughly to the United Kingdom (UK) in term of numbers, where there are 30 schools of pharmacy for a population of 68 million (subject to total number of yearly graduates to actively professionals).

4.1. Assessment of current pharmacy programs in the UAE

Although all BPharm degrees in the UAE must consist of more than 130 credit hours, the standard deviation of total number of hours is 18 credit hours - equivalent to an entire semester under the American system of credit hours calculation that is applied in UAE universities (US Department of Education, 2008). There were variations in the number of credit hours and consequently in the study period between the programmes. In some cases, a full academic year of difference is observed universities that are supposed to similar learning outcomes, so that they offer degrees that are similarity regarded by the local authorities (Fig. 2). Significant differences in the number of semesters are not found in other developed countries universities of, for example, the UK, where pharmacy students are required to complete 480 Credit Accumulation and Transfer Scheme (CATS) (Hart, 2005).

4.2. National accreditation of pharmacy programs in the UAE

Our study found that colleges of pharmacy in the UAE have aligned their programme learning outcomes appropriately with CAA guidance (Commission for Academic Accreditation Ministry of Education, 2019b). Program learning outcomes in all colleges were equivalently aligned with the 3 strands of the CAA. All inves-

tigated universities distributed their learning outcomes across all strands with higher emphasis on strand 3–5 (aspects of competence), whereas RAK university had higher focus on strand 2 (skills and performance) (Table 2). However, Fatimah College of Health Sciences was not included in Table 2 because the PLOs details were not posted on its website as per CAA strands.

The CAA framework does not, however, provide specific guidance for the pharmacy degree accreditation in the country, which impacts on universities' ability to align their degrees to country needs and vision. In the UK, a country with similar legislative structure, there are two pharmacy specific accreditation bodies: the General Pharmaceutical Council (GPhC) for England, Scotland, and Wales and The Pharmaceutical Society of Northern Ireland (PSNI) for Northern Ireland (Stewart and Letendre, 2018). They look after MPharm programs accreditation and framework for the profession vision in the UK. Several regulatory agencies are active in the UAE with respect to the pharmacy profession. These are the centralized authority of the MoH and two semi-centralized health authorities (Department of Health-Abu Dhabi and Dubai Health Authority) in the Emirates of Abu Dhabi and Dubai, respectively. This works in parallel to the involvement of the Emirates Pharmacy Society in the continuous education of pharmacists in the country, by providing certified continuous medical education (CME) (Rayes et al., 2015). This regulatory environment may have a dual role. Form one side, it may slow the establishment of agreed grounds for changes to the education and profession of pharmacy among different emirates. but it may also offer great support in terms of realignment of the UAE pharmacy programmes with a clearer vision for universities to follow and adapt in the future especially with the UAE's National Agenda 2021 and beyond (Gulf Medical University, 2020).

4.3. International accreditation of pharmacy programs in the UAE

Three programmes have been granted Certification by the Accreditation Council for Pharmacy Education (ACPE), USA (Table 1). Other universities had their curricula form Australian universities but were not granted accreditation by the Australian Pharmacy Council (APC). Recently, there has been a positive step towards increasing the minimum number of credit hours for the BPharm degree to 150 credit hours and at least 960 contact experiential hours (24 weeks or 24 CH) (Ajman University, 2019; Ashames, 2019), as part of the 2019 CAA and ACPE summit meeting (Gulf Medical University, 2020). This should be further taken to simply simply increase total degree credit hours, but also to reduce the inconsistency among universities graduating students with the same titled degree. In 2017, there were advances towards international certification of pharmacy programmes in the country, where the Ministry of Education signed a Memorandum of Understanding with the US Accreditation Council for Pharmacy Education (ACPE) (“Ministry of Education signs MoU with the Accreditation Council for Pharmacy Education (ACPE),” 2017). The involvement of international pharmacy-specific accrediting bodies can help with worldwide recognized pharmacy professional trends and teaching technologies. However, they will have limited ability to inform the preparation of pharmacy graduates to meet country-specific needs, and therefore the need for local stakeholder support is crucial.

4.4. Job marked guided pharmacy curriculum development in the UAE

The pharmacy job market is expanding in the same way to the UAE population (from around 4.2 million in 2006 to 10 million in 2020) (The Federal Competitiveness and Statistics, 2020; Worldometer, 2020), which underlines the need to expand in terms of healthcare facilities (The Federal Competitiveness and Statistics, 2020). Considering the number of individual facilities

within each aspect of the pharmaceutical sector, the highest percentage increase between 2010 and 2015 was observed with scientific offices. These offices are branches of international pharmaceutical industries that employ pharmacists as medical representatives. However, the lowest recorded growth is with local pharmaceutical industries and associated pharmaceutical distribution stores. This shows clearly that employment growth in pharma industry is not mainly around manufacturing facilities but rather marketing branches (scientific offices). Furthermore, this is not as important as clinical practice with more than 30% increase in numbers of community pharmacies, emphasizing on pharmacist's employment in this sector over pharmaceutical industry sector (Table 3). This is in agreement with other parts of the world, where pharmacists are employed in order of community, hospitals, industry-related, academia, and finally regulatory positions (Bates et al., 2016). While BPharm graduates may proceed to any of these areas, a study in the University of Sharjah highlighted that the majority (82%) of the BPharm student respondents would prefer to work in hospital/clinical pharmacy following graduation (Abduelkarem and Hamrrouni, 2016). Given that students are keen to work in clinical settings, and that other healthcare professionals and job market growth expect pharmacists to contribute in this way, it is important to ensure that BPharm students are equipped to pursue and succeed in a career in this area. Clinical practice is core of the profession not only in hospital settings but also in community pharmacies like immunization and patient consultation. This vision needs to be clearly desinated within phramcy coricula to support that clincal practice in the UAE is not limited to hospitals but also to community practice. In 1999, The UK had the vision to initiate non-medical prescribing (NMP) healthcare professionals with the aim of patient care amelioration and making use of qualified health care staff in easing and speeding up patient access to medication (Hobson et al., 2010). This involved pharmacists as either supplementary or independent prescribers (Tonna et al., 2007), afterwards, universities and regulatory authorities worked together to this aim with changes to accreditation specifications and curricular contents where it passed through a period of transient form an extra qualification to the MPharm degree and the hope to become part of future MPharm programs (Abuzour et al., 2018; "Foundation year independent prescriber training will not begin in 2021, GPhC confirms," 2020). This shows a possible pathway for curriculum changes in the middle east starting from a vision that translates into an action supported by accreditation bodies with transitioning stages until finally reaches the university levels.

4.5. Recommendations

We recommend that pharmacy programs can focus more on clinical care and other courses that can improve the practical skills of the students to meet the needs of pharmacy professions, which mainly take place at the community and hospital pharmacies.(Al-Ghananeem et al., 2018). Furthermore, expanded practice such as immunization and the use of clinical skills should be covered and maybe examined in OSCE's as they should be routinely performed in community pharmacies. However, the percentage of social/behavioural/administrative and other clinical science courses, that equip students with patient consultation and related skills, has an average of 20%.Focusing on this percentage, the contribution of clinical skills to the 20% allocated credit hours is overtaken by social and administrative courses that does not specifically involve clinical sciences. The aim of this recommendation is to strengthen the graduates' skills to provide a positive impact on the way pharmacy is practised and raise its standards of practice.

Pharmacy practice skills (i.e., communication with patients, healthcare professionals and drug dispensing skills) are also essen-

tial aspects in any pharmacy program to train students for their future's employment. Practical training in community, hospital-based pharmacy and industry training is usually conducted before student's graduation to fulfil degree requirements, and this is completed through continuous training either on a weekly basis during the full academic year of study or as part of the final year of the degree. However, there is a significant difference in the number of credit hours for training (21.7 ± 7.0) and practical part of curriculum of pharmacy education (9.9 ± 2.2) among different universities (Fig. 2). A further outcome of the 2019 UAE Pharmacy Education Summit is to require at least 960 contact practical hours on pharmacy programmes (Ashames, 2019), and therefore this is a positive step towards providing more equitable clinical skills education across BPharm programmes. All pharmacy graduates from the UAE must complete at least six-month training period to be eligible to apply for the MoH exam. This training period has no clearly defined learning outcomes, or official supervision to assure the quality of the training provided to the graduates. Expert's design of the training learning and assessment methods is also essential in supporting student's transition to employment. Pharmacy education should foster the development of many skills needed by the job market in the UAE (Table 4), which can be summarised under three main headings.

4.5.1. Core skills for the pharmacy profession

- Application of more pharmacy courses that links both the knowledge-based skills to the communications skills covering all levels of blooms taxonomy and all strands of the CAA framework and can take an integrated approach (Austin et al., 2006; Corbo et al., 2006; Husband et al., 2014).
- The purposeful integration between pharmaceutical sciences practical, quality control course and the supervisory skills gained from the pharmaceutical management course to support the role of the pharmacists as supervisors not only in community but also in hospital pharmacies and stores (Latif, 2004).

4.5.2. Support for successful transition to practitioners

- Supporting students bridging to professional tools and increasing their engagement with them, for example, introducing external seminars besides the pharmacy placements to increase student familiarity with professional life before graduation (Hasan et al., 2013).
- Inviting speakers from the MoH and other regulatory bodies can be an important practice in the delivery of quality-related subjects and to cover topics on quality-related jobs (Regulatory Affairs jobs in Table 4) and help to reshape student perception and vision about the future of the profession in the country (Zorek et al., 2011). These talks should be embedded within the courses to make it sustainable.

4.5.3. Transferable skills

- Critical thinking and problem-solving abilities are required in different areas of pharmacy future jobs as mentioned indirectly in Table 4 (Points 1 and 3 in community and hospital pharmacy jobs besides to point 1 in medical representative). Developing such skills in stages with degree progression can be done with the aim to train students to perform a critical literature review and individual critique to published articles as tasks that can be practiced in their final year assignments portfolio (Peeters et al., 2016).
- Embedding of communication skills such as presentation skills and role playing scenarios, that can increase in complexity with each level of study in the degree, for example starting with

group presentations until it achieves individual assessment of student communication skills in OSCEs (Adrian et al., 2015; Ofstad and Brunner, 2013). This approach fits with supporting students' development of supervisory skills required in community, hospital, and pharmaceutical stores jobs (Table 4).

- Enhancing pharmacy students numeracy skills, where colleges can screen the market for pharmacy management software (Bissell et al., 2008). Clinical subjects in the early level of the degree on correct dosing calculations than can be both a way to develop critical analysis and judgment skills besides to highlight its continuous use in hospitals (Rutter and Watts, 2010).
- Embedding report writing skills not only in laboratory practicals but also the creation of written coursework for students to improve their writing skills with the use of advanced tools to deliver feedback. This is especially important in UAE where English is not the students' first language but routinely used to teach pharmacy (Diaz-Gilbert, 2005).

4.6. Limitations of the study

The information on the programme description and assessment methodologies in the colleges of pharmacy in the UAE was obtained from the universities' websites, which restricts the discussion for best practices in these areas publicly available information. Moreover, the job market search on Google® and LinkedIn® search engines used for over a six-month period in the year 2020, and as such the data discussed here, is just a primary step in market analysis for pharmacy graduates in the UAE.

5. Conclusion

The development of pharmacy curricula is a multi-factor process, where input from different stakeholders should be included and is becoming more and more important in developing regions like the Middle East. Regulatory bodies, universities and economic trends in the job market are factors to consider in improving pharmacy education. This article proposes a four layers strategy that enables, universities and local authorities to cooperate on pharmacy circular development using, current status, national and international accreditations, and job market. The proposed strategy was applied to the UAE as a model and examined BPharm programs provided by the universities across the country.

Ten universities in the country offer BPharm degree and all of them are nationally accredited by CAA (Layer 1 and 2). Variations in content were observed among pharmacy programs in the UAE, which may raise concerns especially with PLOs, total number of credit hours and contents allocation using CCAPP international program accreditation (layer 3). Then a discussion on how this can be realigned to fit with both international norms and the UAE vision where presented with key steps that has been being initialized in 2019. The UAE job market (layer 4) was also investigated and collected practical skills that guided the discussion of areas of granular improvements in the pharmacy curriculum towards a more clinical and practice-related scope. The methodology followed here, in the case of the UAE, can be further explored in other Middle Eastern countries.

The article provides a useful strategy to analyse pharmacy curricula in the Middle East. It can help guide education and health authorities, and universities to cooperate on making pharmacy education a true reflection of their countries social and economic needs.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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