

Implementation of an ACPE Accredited Pharm.D. Curriculum at KSAU-HS College of Pharmacy, Saudi Arabia

Abdulmalik M. Alkatheri, Pharm.D.,

Professor, Pharmacy Practice Department, College of Pharmacy, King Saud bin Abdulaziz University for Health Sciences, Riyadh 11481, KSA.

Assistant Vice President, Development and Quality Management Affairs

Consultant Clinical Pharmacist-Nephrology, Pharmaceutical Care Department, King Abdulaziz Medical City, Ministry of National Guard Health Affairs, Riyadh, 11481, KSA.

katheria@ngha.med.sa

Abdelkareem M. Albekairy, Pharm.D., MSc

Associate Professor and Dean, College of Pharmacy, King Saud bin Abdulaziz University for Health Sciences, Riyadh 11481, KSA.

Consultant Clinical Pharmacist-Solid Organ Transplant, Pharmaceutical Care Department, King Abdulaziz Medical City, National Guard Health Affairs, Riyadh, 11481, KSA.

bekairy@ngha.med.sa

Nabil Khalidi, Pharm.D., FASHP,FLDI

Professor and Chairman, Pharmacy Practice Department, College of Pharmacy, King Saud bin Abdulaziz University for Health Sciences, Ministry of National Guard Health Affairs, Riyadh 11481, KSA.

Clinical Associate Professor Emeritus, University of Michigan College of Pharmacy, Ann Arbor, Michigan 48109

khalidin@ksau-hs.edu.sa

Stephanie J. Phelps, BS.Pharm, Pharm.D., BCPS, FCCP, FAPhA, FPPAG

Associate Dean, Academic Affairs

Professor, Clinical Pharmacy and Pediatrics, The University of Tennessee Health Science Center College of Pharmacy, Memphis, TN 38163

sphelps@uthsc.edu

Dick R. Gourley, Pharm.D.

University Affiliate, The University of Tennessee Health Science Center Research Foundation, 211 Conference Center Building, 600 Henley Street, Knoxville, Tennessee 379964122

dgourley@tennessee.edu

Majed Al Jeraisy, M.Sc., Pharm.D., Med. Ed.

Chairman, Research Office, King Abdullah International Medical Research Center.

Assistant Professor, College of Pharmacy, King Saud Bin Abdulaziz University for Health Sciences.

Consultant Clinical Pharmacist-Pediatrics. King Abdulaziz Medical City, National Riyadh 11426, KSA

jeraisym@ngha.med.sa

Amjad M. Qandil, PhD

Professor and Chairman, Pharmaceutical Sciences Department, College of Pharmacy,
King Saud bin Abdulaziz University for Health Sciences, Ministry of National Guard Health
Affairs, Riyadh 11481, KSA.
qandila@ksau-hs.edu.sa

Corresponding Authors:**Abdulmalik M. Alkatheri**

Professor,
Pharmacy Practice Department,
College of Pharmacy,
King Saud bin Abdulaziz University for Health Sciences,
Ministry of National Guard Health Affairs,
Riyadh 11481, KSA.
Phone: +966 11 4295005
Fax: +966 11 4295057
e-mail: katheria@ngha.med.sa

ABSTRACT

Objectives. To pursue a successful academic curricular collaboration between the newly established College of Pharmacy at King Saud Bin Abdulaziz Saudi University for health Sciences (KSAU-HS) and an ACPE accredited American college of pharmacy.

Methods. Criteria were set for selecting a College of Collaboration. A systematic approach was followed in negotiating legal, logistical, and financial issues with the selected collaborating institution. Course materials were transferred through Dropbox. Transferred courses were implemented with minimal alteration such as re-alignment and re-sequencing of lectures. Research and seminar courses were added, and pharmacy practice experiences were designed and rubrics were expanded.

Results. All courses were implemented successfully. Pharm.D. students scored significantly higher in all academic levels in a benchmarked progress test than students in other programs. Students' evaluation of 43 P1-P3 courses in 2017-2018 using a survey which comprised 24 positively-stated items on a 5-point Likert scale assessing numerous aspects of each course showed significantly higher overall satisfaction than the institutional averages. Also, female students showed significantly higher perceived satisfaction than male students in the program.

Conclusions. This curricular transfer was smooth and timely and learning and teaching success was facilitated by the KSAU-HS College of Pharmacy faculty. Program outcomes was verified by the high results of students in a benchmarked examination and by their perceived satisfaction with their courses. College of Pharmacy has submitted its first national accreditation application in the end of academic year 2017-2018.

Keywords: Curriculum Implementation, Collaboration, Pharm.D. Program, Curriculum Development, ACPE-Accredited Program

INTRODUCTION

In Saudi Arabia, the ratio of pharmacists in the public sector to the patient population is only 0.13/1000,¹ which is seven times less than what it is in the United States (1.01/1000).² Thus, to render pharmaceutical care to its population and to facilitate the launching of healthcare initiatives, the country had to resort to multiple strategies to increase its human professional resources. Contracting foreign healthcare providers and educators to supplement the pharmacist workforce; offering Pharmacy scholarship programs to Saudi students to study abroad in pursuit of higher education and post graduate training; expanding the enrolment in the ASHP accredited postgraduate pharmacy residency training program were among such executed strategies. However, the long turnaround time of the returning graduates, the limited number of locally

trained graduates, the high turnover of foreign contracted clinical pharmacists, and certainly the difficulty, cost, and the time consumed in recruiting replacement workers have favored the fast creation of institutions of higher education.³ Many of these new institutions have, therefore, sought international collaborations to facilitate speedy and quality implementation of educational programs. This institution was among those who favored this pathway.

With the recent successful outcomes in global health research and intervention, a new attitude of international cooperation has emerged amid diverse professional and academic entities in the developed and developing countries.^{4,5} What may have started as health aids and missions of healthcare volunteers, selected collaborative research, and international medical intervention by government and non-government agencies has now expanded to encompass formal collaborative agreements in research, teaching, training, and intervention.⁶

A prime example of such cooperation is the establishment of the United States-Thai Consortium between eight Thai schools of pharmacy and nine US colleges with the major goal of expanding colleges of pharmacy in Thailand through training of new faculty, a program that was planned to last until 2022.⁷

King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), was established in 2005 within the campus of King Abdulaziz Medical City (KAMC), Ministry of National Guard Health Affairs (MNG-HA) in Riyadh. In academic year 2013-2014 a dedicated state of the art university campus the hosts the colleges of Medicine, Dentistry, Pharmacy, Nursing, Public Health and Health Informatics, Applied Medical Sciences, Science and Health Professions. This campus is across the street from the Medical City that houses Joint Commission International accredited 1250 operational beds tertiary care facility. The College of Pharmacy was announced in 2010 and officially admitted its first class of students in 2012 to fulfil the institutional mission

which states that “KSAU-HS provides high quality health sciences education, health-related research, and community services that promote the health of society” and vision which is “to achieve global leadership in health professions education, with commitment to excellence in research, patient care, and community service”.

Following the announcement to establish the College of Pharmacy, there was a general consensus to acquire the Doctor of Pharmacy curriculum from a relatively high-ranking ACPE accredited College of Pharmacy in the United States. This direction was in line with the desire among pharmacy academicians at KSAU-HS to implement a curriculum that is patient-centered and clinically-focused⁸ to produce competent pharmacists who can relieve the limited supply of locally trained pharmaceutical care providers.^{3,9} It is clear that pharmacy practice in its academic and practice components share similar global challenges in meeting societal needs and individual professional aspirations,¹⁰ thus, acquiring an American curriculum through a collaborative agreement with an ACPE accredited program became quite attractive although examples of such collaboration with internationally established Schools of Pharmacy were relatively limited.¹¹

Such curricular acquisition would give the newly established College of Pharmacy the advantage of implementing an already established curriculum that would require limited, but necessary modifications and improvements that reflects the country and its culture in areas related to pharmacy administration and pharmacy law to accommodate the Saudi Arabian Laws regulating healthcare and health services provision in addition to medication therapy management and training in sites such as ambulatory care and community pharmacies to accommodate cultural issues and concerns¹². It would also serve as the conduits for graduating competent clinical practitioners that are capable of meeting the challenges of a rapidly expanding healthcare system. Moreover, under this time limited collaborative agreement, the KSAU-HS

College will continue to implement an ACPE-accredited program while it is in planning its own research and teaching innovations. The new College capitalized on the advantage of affiliating the clinical pharmacists and residents of the MNG-HA Hospitals located on campus with its teaching program. The Post Graduate Residency in MNG-HA received the American Society of Health-System Pharmacists (ASHP) accreditation in 2013. This work details the process of establishing and assessing curricular collaboration between the College of Pharmacy at KSAU-HS an ACPE-accredited American College of Pharmacy.

METHODS

Needs Assessment and Development of Selection Criteria

The KSAU-HS announced the establishment of the College of Pharmacy in 2010. As such, a steering committee of ten academicians and practitioners was established. Seven of them were senior US trained clinical pharmacists who had academic appointments in the College of Medicine, and three non-pharmacy faculty members who were the chairmen of three departments from the College of Medicine namely medical education, basic medical sciences and basic sciences. The committee was charged with planning the launching of the College of Pharmacy on the KSAU-HS campus within two years. The task was to seek a reputable and accredited Doctor of Pharmacy (Pharm.D) Program, preferably from the United States, which meets the needs and expectations of KSAU-HS. Once identified, negotiations with that program were to begin with a goal of submitting a comprehensive Pharm.D Program proposal to the university administration.

The committee began its activities by formulating a list of twelve criteria, table 1, to rank colleges it intends to negotiate with. The criteria and the weight assigned to each criterion

commensurate with KSAU-HS College of Pharmacy's "Needs Assessment" and what was felt a priority by the steering committee.

Choosing The Program:

Stage One. The criteria were used as a rubric by the steering committee to evaluate the twenty-five colleges for potential collaboration. Exclusion criteria was scoring less than 50% in the rubric or already having some sort of collaboration with other Saudi universities.

Stage Two. A written communication followed with the selected Universities inquiring about the feasibility of future collaboration. To assist the American Universities in considering the proposed collaboration, a key KSAU-HS information related to size and nature of the institution, mission, vision and supporting facilities especially affiliated hospitals was furnished.

Stage three. Dialogue with the shortlisted institutions that were prepared to receive collaboration proposal was then focused on matters pertaining to curriculum licensing, access to curriculum software and PowerPoint files, use of established syllabi and examination banks, assistance with faculty enhancement and exchange programs clinical workshop offerings; preparedness to assist in accepting qualified students in postgraduate and graduate academic and professional training programs and desirability to conduct collaborative research in areas of strength and societal need in Saudi Arabia.

Planning the Negotiations with the Selected College:

A delegation composed of the steering committee chair and two selected pharmacy practitioners was authorized by the KSAU-HS administration to conduct a site visit to the chosen American Pharm.D. Program from the University of Tennessee Health Science Center (UTHSC) and to negotiate the terms of a contract including financial compensation. Over a four-day period

in March 2011, the delegates met with UTHSC campus administration and UTHSC College of Pharmacy leadership, had discussions with various course coordinators and faculty, and visited applicable College sites.

The Transfer and the Adoption of the Curriculum:

It was attempted to use an international courier to transfer large amounts of materials via a thumb-drive, but security issues and delivery logistics caused persistent delays in the delivery of materials. Alternatively, a shared Dropbox™ business account was established to facilitate the transfer of large size curricular files and images.

Pre-implementation Course Modifications and Design.

Content expert reviewed the courses received from UTHSC to perform limited and absolute necessary changes to ensure that the course material is up-to-date, lectures are properly sequenced and aligned between courses with minimum redundancy. In addition, experiential training courses which were outside the agreement with UTHSC and few new courses (8 Credit Hours) were completely designed by KSAU-HS content experts.

Post-Implementation Course Updates.

Once courses were taught for the first time using UTHSC College of Pharmacy approach and material, faculty members were asked at the end of each course to respond to a 17-item questionnaire assessing their experience and student responses to the taught course. Faculty recommendations were then included in new course books and proposals for adding, deleting, revising, and re-sequencing lectures had to be justified on a form especially designed for this purpose. These requests had to be reviewed by the Curriculum Committee and approved by the College Council to be implemented.

Assessment of Student Learning from the Implemented Curriculum:

The success of the collaboration was assessed through:

Performance of KSAU Pharm.D. Students in an Externally Benchmarked Progress Test, Academic Year 2017-2018: The progress test is a 100 MCQs examination that is a constructed by faculty members from three national Pharm.D. Programs, including KSAU-HS, and is administered to students in the Professional Years 1-4 in these programs. Other two programs which are used as external benchmarks included one Pharm.D. program that is nationally accredited and another that is internationally accredited. The examination evaluates the progress of students' knowledge and abilities from one academic level to another. Each of the MCQ questions is worth one grade and they covered the various disciplines of Pharmacy; 27% for Pharmaceutical Sciences and 73% for Pharmacy Practice.

Students Course Evaluation Surveys: This provides indirect measure of collaboration success. KSAU-HS deploys standardized Course Evaluation Surveys that are filled by students for every single course that they complete. In addition to demographics, each survey contains 24 positively-stated items that assess numerous aspects of each course and measured on a 5-point Likert scale: 5 = "Strongly agree", 4 = "Agree", 3 = "Neutral", 2 = "Disagree" and 1 = "Strongly Disagree"; with higher scores indicating more favorable evaluation. The 24-item survey is divided into four parts pertaining to: (a) beginning of the course (preparation), (b) what happened during the course (delivery), (c) perceived impact on student development and (d) overall course evaluation.

Statistical Analysis. Descriptive and univariate statistical analyses of student grades in the Externally Benchmarked Progress Test and student satisfaction scores in Course Evaluation Surveys were performed using One-Way ANOVA and t-test. All statistical analyses were performed using SPSS 21.0 [Release 21.0.0.0, IBM, USA].

RESULTS

Choosing the Program:

Stage One. After excluding institutions that already had some sort of collaboration with other Saudi universities, ten out of twenty-five American colleges met all or most criteria, table 1, and scored more than 50. Additionally, two who scored above 50% were eliminated due to limited success of Problem Based Learning (PBL) in their curricula based on the steering committee analysis. This led to a list of eight potential universities after stage one.

Stage Two. After sending written requests and reviewing the replies of the Schools of Pharmacy, the list was finally narrowed down to five. Some schools had concerns related to intellectual property of the curriculum while others were deterred by the cost and complexity of transferring the curriculum.

Stage three. After a direct dialogue with the five shortlisted institutions and review of the outcomes of these dialogs, it was finally decided that the University of Tennessee Health Science Center (UTHSC) was the most suitable candidate for collaboration.

Planning the Negotiations with the Selected College(s). The delegation authorized by the KSAU-HS administration to negotiate the terms of a contract including financial compensation was faced with concerns raised by UTHSC faculty related to intellectual property and ownership of their respective educational materials. While UTHSC administration was also concerned about this item, they were most interested in the protection of the UTHSC brand and adherence to US copyright protection of items that would be provided. It was clear from UTHSC policy that all intellectual property related to education is owned by the faculty member who created that content. Several sessions were held to educate UTHSC faculty in the College of Pharmacy and Department of Pharmacology in the College of Medicine about the collaborative

agreement and opportunities to participate. A written release was created and approved by UTHSC and the University of Tennessee. All faculty members wishing to participate were required to sign the release. All but two faculty members agreed to participate, an issue that was resolved internally by UTHSC. US Copyright laws posed a greater challenge. It was feasible to use images in lectures from course adopted textbooks. Similarly, images available on US government sites were also acceptable for use provided the source was cited. At times it was extremely difficult to identify who owned the copyright to a particular image. This was especially true if the image randomly appeared on the Internet without a citation. In order to address these gaps UTHSC hired a graphics designer who worked with faculty to create original images for use in lectures. Once these details were addressed a memorandum of understanding was signed, which authorized the KSAU-HS College of Pharmacy to acquire the programs and resources listed in Table 2.

The Transfer and the Adoption of the Curriculum:

Material was transferred sequentially into the business Dropobox® starting by the first professional year and were provided one year in advance of the time the course would be taught. The transferred material included curriculum plan, course descriptions, course syllabi including lecture topics and schedules, PowerPoint™ presentations of lectures and an examination bank. The UTHSC College of Pharmacy also provided a variety of electives that were selected by KSAU as subjects of interest. Clinical pharmacy faculty who are graduates and trainees of the American educational system and were also experienced practitioners at the Ministry of National Guard Health Affairs (MNG-HA), along with select pharmaceutical sciences academicians were positioned to receive, coordinate and teach the transferred courses. Courses were coded according to the KSAU-HS system into the curriculum plan (Table 3) and the study plan was submitted for approval by KSAU-HS University Council. With the approval of the proposed

study plan, experienced faculty were assigned as course coordinators and were asked to examine the material, especially to ensure that they are up-to-date with regard to clinical guidelines and any new emerging drug therapy. Course books (course syllabi) were designed by course coordinators, then reviewed by the college Curriculum Committee and endorsed for approval to the College Council one semester before the course is to be delivered. Course lectures were modified if needed to include only new developments in the field taking into account the Saudi healthcare system, the KSAU-HS pre-professional curriculum, and the local culture. Students' assessment plan was developed immediately upon the receipt of the curriculum. Course by course rubrics were designed for appraising student performance in non-exam sessions and were included in the corresponding course books. The UTHSC examination bank was not used as there was a genuine desire in the KSAU-HS College of Pharmacy for faculty to prepare their own exam questions that reflect the class activities in the environment they are taught

Meanwhile, senior members of the implementation team at KSAU-HS College of Pharmacy met monthly via video conferencing with the senior UT College of Pharmacy in charge of the curriculum transfer for consultation and follow up and to discuss items related to the agreement. About a year into the agreement, UTHCS released new Student Learning Outcomes, which were provided to the KSAU-HS College of Pharmacy.

Pre-implementation and Post-Implementation Course Modification, Design and Updates.

Specific courses that were modified pre-implementation. Medicinal Chemistry lectures were aligned with Pharmacology lectures. Additionally, therapeutics courses lectures were re-sequenced and redundancies were eliminated. All therapeutic courses were taught onsite and assessed by KSAU-HS clinical pharmacy faculty who are graduates of the ACPE accredited American educational systems and who had completed PGY-1 and/or PGY-2 accredited

residency programs and/or fellowships. Select UTHSC faculty were also invited to deliver a number of Therapeutics lectures and write exam questions on the material they taught. Once the program was fully operational, meetings were held on an as needed basis. Clinical Toxicology which was an elective course in the UTHSC Pharm.D. curriculum was used by KSAU-HS as a mandatory course. Introductory and Advanced Pharmacy Practice Experience (IPPE & APPE, 51 Credit Hours) which were outside the agreement were fully designed while the placement of experiential experiences courses within the curriculum and their objectives were in harmony with UTHSC Pharm.D. curriculum and requirements of ACPE. Finally, 5 new courses were added, namely Research Proposal, PharmD Research, Pharmacy law, Immunizations, and Seminar totaling 8 credit hours. Post-implementation, more changes were allowed which were reviewed thoroughly by the College of Pharmacy Curriculum Committee and then endorsed for approval by the College Council. The course's iterations from one year to another were documented in an in-house developed Course History form. Table 4 is showing the Course History Form for Medicinal Chemistry I (PHBS 303) which is prepared by course coordinators to provide an overview for the changes in the course's theme, delivery methods and assessment. All changes are justified in an accompanying document and are discussed in the department council, reviewed in the Curriculum Committee and approved by the College Council. This form is a valuable tool for instructors, curriculum managers and accreditors to visualize course's evolution from one year to another without the need to dig deep into past course books.

Assessment of Student Learning from the Implemented Curriculum:

Performance of KSAU Pharm.D. Students in the Externally Benchmarked Progress Test, Academic Year 2017-2018. The progress test was held in the mid of the second semester

of the academic year 2017-2018. The test was chosen as a tool to assess student learning from the implemented curriculum because it is benchmarked, administrated to students in all the professional academic level, i.e. Professional Year 1-4 and cover all learning domains with proportions the corresponds to their share in the Pharm.D. curriculum, i.e. 27% for Pharmaceutical Sciences and 73% for Pharmacy Practice. There will be no female students in Professional Years 4 in the KSAU-HS program tell the academic year 2018-2019.

Number of students who sat for the test from male (M) and female (F) students in the three programs are shown in table 5, which also shows the average grade (%) of students segregated by academic level (P1-P4). The average grade of KSAU Pharm.D. students was increasing going from academic level to the upper and they were significantly different among these levels, P1-P4 for males and P1-P3 for females. Additionally, the average grades were significantly higher for KSAU-HS Pharm.D. students compared to grades of students from benchmarking program in every academic level for both male and female students without an exception.

Students' Evaluation of Courses. Institutionally designed and deployed Course Evaluation Surveys were completed by 2247 students from 13 different programs, (43.75% male vs. 56.25% female) in the university during the Academic Year 2017-2018. For the same academic year, a total of 69 male and 89 female P1-P3 students evaluated 21 courses in the first semester, and 69 male and 84 female P1-P3 students evaluated 23 courses in the second semester with average response rates of 92.32% and 90.00% for male and female students, respectively. Descriptive statistics for KSAU-HS Pharm.D. students who completed surveys and survey results can see in table 6. For the first semester courses, the overall course evaluation has shown statistically significant difference between male and female students with a t -value = 2.28 and p -

value 0.028 ($p < 0.05$). Only, the overall course evaluation by male students was significantly higher than the institutional male average (3.50 ± 0.05), p -value 0.0001 ($p < 0.05$). While for the second semester courses, the overall course evaluation has shown statistically significant difference between male and female students with a t -value = 2.94 and p -value 0.005 ($p < 0.05$). Additionally, the overall course evaluation by male and female students was significantly higher than the institutional male and female averages (3.43 ± 0.05), p -value 0.0001 ($p < 0.05$) and (3.38 ± 0.05), p -value 0.0001 ($p < 0.05$), respectively. Graphical depiction of the results is seen in Figure 1.

DISCUSSION

The push for a certain level of international collaboration between colleges of pharmacy seems to be more common now than decades ago. According to two unpublished surveys conducted by the Universities of Samford and Illinois in 2007 and 2010, respectively and reported by Audus, K.L., et al. (2010), 63 colleges in the United States had some sort of a cooperative agreement with international colleges.⁷ The Accreditation Council for Pharmacy Education (ACPE) had also started in 2012 to certify pharmacy professional degree programs outside the United States, hence, bringing uniformity to curricular development.¹³ Almost simultaneously, the Global Alliance for Pharmacy Education (GAPE) agreed to promote the sharing of quality pharmacy education resources globally to benefit all parties from best practices wherever they are demonstrated.¹⁴

The colleges of pharmacy outside the United States seeks to benefit from the experience of their American counterparts has been well demonstrated over time. This fact was indirectly supported by a reported stronger readership to the American Journal of Pharmacy Education when it implemented its open access online publishing concluding that the American experience

is of interest to international pharmacy schools.¹⁵ Benefits of educational collaborative efforts between institutions range in scope from simple academic guidance and professional advice, to a full-fledged exchange of students, resources, faculty, and research collaboration, with or without any financial commitments. In collaborative agreement of KSAU-HS College of Pharmacy with the University of Tennessee College of Pharmacy, the major advantage has been the ability use a curriculum from an ACPE accredited program thus giving the limited number of faculty in this young college the opportunity to build-up its physical and academic infrastructure.

Not allowing immediate course revisions or alterations to individual lectures in the first year of implementation had, in effect, protected the integrity of the transferred curriculum. Thus, senior college leaders did not have to be concerned about major omissions and/or additions that may result in misalignments or weaknesses in the curriculum. Nevertheless, KSAU-HS College of Pharmacy faculty had to create new courses either because of licensing limitation preventing their transfer such as the course on “Immunizations”, or due to the need to adapt these courses to the local environment such as the “Introductory Pharmacy Practice Experiences (IPPE I-III)”, and “Law”. Like IPPE, APPE I-IX were not included in the agreement are were designed at KSAU-HS College of Pharmacy to take into consideration the tight integration between the MNG-HA hospitals. A new course was introduced namely the Pharm.D. research course as an initiative of the College of Pharmacy leaders to stress the value of supervised student research in producing well-rounded modern clinical pharmacists to fulfill the country’s needs. Another course that was introduced, the “Seminar” course is intended to further the students’ communication skills in evidence-based topics presentations. For all these courses and experiences complete course books with general learning outcomes, lecture/sessions learning outcomes, assessment tools and methodology, grading criteria and required reading material

were also developed. In most of the courses in the Pharm.D. study plan student are subjected to continuous assessment with a final examination at the end of every semester. Furthermore, College of Pharmacy P1-P4 students sit for a Progress Test that is held annually. With regard to IPPE and APPE assessment, it is usually performed through student portfolio in addition to special rubrics and forms. In APPE, the student must pass each rotation independently to pass the internship year

In addition to highly qualified, mostly American or Western educated faculty and an affiliation with one of the largest tertiary healthcare systems in Saudi Arabia, the College of Pharmacy at KSAU-HS has a robust teaching and learning monitoring system. The college home is a new state of the art building that have class rooms and laboratories that are equipped with advanced education technology tools, laboratory equipment and clinical simulation tools such smart mannequins. Administratively, college and department councils play their classical roles to facilitate student teaching and learning. Additionally, the college has an Academic Affairs Department managed by the Associate Dean for Student and Academic Affairs who also chairs the Curriculum, Assessment and Student Progress Committees. The same department oversees the Assessment Unit that manages all assessment tools used in the college of pharmacy leaning and teaching experiences and the Student Affairs Department that deals with the day to day issue of student attendance, follow up and offer assistance when needed. Each course has it coordination team to guarantee suitability of teaching material and assessment items for the attainment of learning outcomes of the course and equity of experiences among different sections for the same course. Furthermore, the college has an academic mentorship program that is mandatory for all of its students, albeit more focused when it comes to students with low achievements. All that is a part of a larger system that included the KSAU Education Affairs,

Supporting Services, Deanship of Students, Deanship of Registration and Admission, Deanship of Library and the Well Student Center which offers psychological and social counseling. By the end of each academic year, the Student Progress and Promotion Committee report on retention rates by calculating the fraction of student who will be promoted to the next professional year from the total number of students who started the current year.

One of the most viable proofs for the successful student learning from the implemented curriculum comes from the benchmarked progress test that assess the learning of KSAU-HS Pharm.D. students from P1 until P4. The higher performance of the program's students than that of students of two nationally and internationally accredited programs is indicates a higher level of learning which is an evidence of the successful implementation of the Pharm.D. program. Administering the North American Pharmacist Licensure Examination™ (NAPLEX®) to our students would have been ideal to assess student learning, however, our request for our students to take the said test was declined.

On the other hand, an indirect assessment of student learning comes from their evaluation of courses in Professional Years 1-3 as APPE rotations in Professional Year 4 are not evaluated using this survey. KSAU-HS Pharm.D. male students' in 2017-2018, first and second semesters, gave their courses statistically higher satisfaction ratings than the institutional course satisfaction average, which was the case for female students' satisfaction ratings of their second semesters courses only. With regard to lower overall evaluation rating of courses by KSAU-HS Pharm.D. female students compared to their male counterparts, the results are consistent with the institutional course satisfaction rating averages which were significantly lower by female students. This result is difficult to explain as teaching in this program is mostly segregated by gender for students and faculty members while most of the studies of gender bias in the

evaluation of teaching are performed in non-segregated models of education. Nevertheless, there is evidence in the literature that male instructors are perceived by male and female students to have better educational skills and were given higher evaluation scores^{16, 17} which might affect female students course evaluation ratings as many of them are taught by female instructors. It will be interesting to investigate this observation in the future.

During the implementation of the curriculum, the College of Pharmacy solicited feedback from students, teaching faculty, and course coordinators through survey tools for the purpose of sharing their learning and teaching experiences respectively. The generated set of recommendations for curricular change was discussed in the curriculum committee and approved by the College Council. The approved changes were implemented the next time the course was delivered.

With the first groups of graduating students in May 2016, 2017 and 2018, the college was able, in time record, to effectively implement an accredited ACPE curriculum while it was building its ACPE-guided infrastructure. The college's strategic choices helped create an atmosphere of synergy, through this collaborative effort, that according to college enrollment plans of about 80-100 students per year will help to ease the notable shortage of pharmaceutical care practitioners in Saudi Arabia in the near future. The college has submitted its first Pharm.D. program accreditation application to the nationally recognized Saudi National Center for Academic Accreditation and Assessment (NCAAA) in May 2018. That said, the Pharm.D. program will closely align itself with current and future ACPE standards and would be more than willing to seek ACPE accreditation whenever it becomes a possibility for Non-American Schools of Pharmacy.

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Table 1. Criteria for Selecting a College of Pharmacy to Negotiate With

No	Criteria	Weight (%)
1	Credibility and reputation of the University and School of Pharmacy to be approached	15
2	Collaboration experience with other institutions	10
3	Willingness to negotiate and assist	15
4	Utilization of Problem Based Learning (PBL) in the curriculum	10
5	Presence of detailed written curriculum	5
6	Transferability of the curriculum from the host school, e.g. presence of web-based curriculum	5
7	Compatibility of the considered curriculum with KSAU-HS mission, vision, values and competencies	10
8	Curriculum requirements matches KSAU-HS available and potential resources	10
9	Innovation in teaching and practical experience e.g. Skills Lab and early clinical exposure etc.	5
10	Opportunities for faculty development if needed	5
11	Track record in curriculum development and revision	5
12	Accreditation status of the candidate school and its national and international recognition for program and its faculty	5

Table 2. Content of the Transferred Curriculum

- Course syllabi (required and electives), handouts, and suggested and/or required reading material
- Educational goals and objectives
- PowerPoint files for all lectures
- All non-Media site videos
- Media site video of UTHSC faculty lectures (pending approval by faculty)
- Examination bank and answer keys
- Access to the licensed courses in UTHSC Blackboard
- Recitations and laboratory assignments and accompanying material
- Pharmacy compounding lab requirements
- Allocation of 3-5 positions for selected Saudi scholarship students for Pharm.D, PhD, residency, or fellowship programs once they pass scrutiny by KSAU-HS and UTHSC

* KSAU-HS, King Saud bin Abdulaziz University for Health Sciences; UTHSC, University of Tennessee Health Science Center

Table 3. Curriculum Mapping (Study Plan)

YEAR 1					
First Semester			Second Semester		
PHBS-301	Pharmacology I	4 (4-0)	PHBS-302	Pharmacology II	4 (4-0)
PHBS-303	Medicinal Chemistry I	4 (3-1)	PHBS-304	Medicinal Chemistry II	4 (3-1)
PHBS-307	Pharmacy Math	1 (1-0)	PHBS-309	Pharmacy Compounding	2 (1-1)
PHCS-302	Basic Clinical & Communication Skills	2 (1-1)	PHBS-308	Pharmaceutics	4 (4-0)
PHBS-305	Physical Pharmacy: Pharmaceutical Principles	2 (2-0)	PHCS-303	Self Care & Non-Prescription Drugs	3 (3-0)
PHBS-306	Sterile Dosage Forms	2 (2-0)	PHCS-304	Introduction to Patient Care	1 (0-1)
PHCS-301	IPPE - I	1 (0-1)			
Total		16	Total		18
YEAR 2					
PHCS-401	Therapeutics I	3 (3-0)	PHCS-413	Therapeutics III	3 (3-0)
PHCS-402	Therapeutics II	3 (3-0)	PHCS-414	Therapeutics IV	3 (3-0)
PHCS-403	Patient Assessment	2 (1-1)	PHCS-409	Applied Therapeutics I	2 (2-0)
PHCS-404	Pharmacokinetics & Dose Optimization	4 (3-1)	PHCS-415	Applied Pharmacokinetics	2 (1-1)
PHCS-405	Pharmacy Management and Economics	3 (3-0)	PHCS-407	Pharmacogenetics/Pharmacogenomics	2 (2-0)
PHCS-406	Design and Conduct of Clinical Research Studies	2 (2-0)	PHCS-408	Medication Therapy Management	3 (2-1)
			PHCS-412	IPPE - II	1 (0-1)
			PHCS-400	Research Proposal	1 (1-0)
Total		17	Total		17
YEAR 3					
PHCS-515	Therapeutics V	4 (4-0)	PHCS-524	IPPE Community	4 (0-4)
PHCS-516	Therapeutics VI	3 (3-0)	PHCS-525	IPPE Institutional	4 (0-4)
PHCS-512	Applied Therapeutics II	2 (2-0)	PHCS-501	Pharmacy Law	2 (2-0)
PHCS-520	Selected Topics in Therapeutic I	2 (2-0)	PHCS-502	Clinical Literature Retrieval & Evaluation	3 (2-1)
PHCS-521	Selected Topics in Therapeutic II	2 (2-0)	PHCS-522	Selected Topics in Therapeutic III	2 (2-0)
PHCS-513	IPPE - III	1 (0-1)	PHCS-514	Selected Topics in Therapeutic IV	2 (2-0)
PHCS-511	Pharm. D. Research	3 (0-3)	PHCS-503	Immunization	1 (1-0)
			PHCS-504	Seminar	1 (0-1)
Total		17	Total		19
YEAR 4					
PHCS-610	Clinical Rotation	4 (0-4)	PHCS-615	Clinical Rotation	4 (0-4)
PHCS-611	Clinical Rotation	4 (0-4)	PHCS-616	Clinical Rotation	4 (0-4)
PHCS-612	Clinical Rotation	4 (0-4)	PHCS-617	Clinical Rotation	4 (0-4)
PHCS-613	Clinical Rotation	4 (0-4)	PHCS-618	Clinical Rotation	4 (0-4)
PHCS-614	Clinical Rotation	4 (0-4)	PHCS-619	Clinical Rotation	4 (0-4)
Total Clinical Rotations		20	Total Clinical Rotation		20
TOTAL CREDIT HOURS				144	

* Introductory Pharmacy Practice Experience (IPPE) rotations must be completed before beginning the Advance Pharmacy Practice Experiences (APPE) rotations series. During the final two semesters all students must take a minimum of ten (10) 1-month APPE. Each student must take one (1) APPE in Institutional Pharmacy Practice, one (1) APPE in Community Pharmacy Practice, one (1) APPE in Ambulatory Care, five (5) APPE in Patient Care areas, and two (2) Elective APPE rotations.

Table 4. Course History Form for Medicinal Chemistry I (PHBS 303)

MEDICINAL CHEMISTRY I (PHBS 303)					
UT-COP	PRE-EXECUTION KSAU-HS / COP (AY 2012-2013)	POST-EXECUTION KSAU-HS / COP			
		(AY 2013-2014)	(AY 2014-2015)	(AY 2015-2016)	(AY 2016-2017)
Themes: 1. Autonomic Nervous System: 19hrs 2. Cardiovascular System: 12hrs 3. Anti-inflammatory agents: 6 hrs 4. Hypoglycemics: 2 hrs 5. Antihistamines: 1 hr 6. Ulcers: 1 hr	Themes: 1. Autonomic Nervous System (18 Lectures): - Reduce 1: Cholinergic Drugs 2. Cardiovascular System (13 lectures) - Add 1 lectures: ACE Inhibitors (1hr) - Add 1 lectures: Angiotensin/Receptor Blockers (1hr) 3. Anti-inflammatory agents: (6 lectures) 4. Hypoglycemics (2 lectures) 5. Antihistamines (1 lecture) 6. Ulcers (1 lecture)	Themes: 1. Add: Drug Metabolism (6 lectures) - Introduction (1hr) - Oxidation I – II (2hrs.) - Reduction and hydrolysis (1hr.) - Conjugation I – II (2hrs.) 2. Add: Acid-base properties and bio-membrane penetration (1hr.) 3. Autonomic Nervous System (15 lectures) - Add 1 lecture: Introduction - Reduce 1 lecture: Adrenergic Drugs (7hr) - Reduce 2 lectures: Cholinergic Dugs (7hr) 4. Cardiovascular System (11 lectures) - Reduce 1 lecture: Diuretic Agents (2hr) 5. Anti-Inflammatory Agents (8 lectures) - Steroids I - V (5hrs) - NSAID's I - III (3hrs) 6. Hypoglycemics (2 lectures) 7. Antihistamines (1 lecture) 8. Ulcers (1 lecture)	Themes: 1. Drug Metabolism (6 lectures) 2. Add 1 lecture: Acid-base properties and bio-membrane penetration (2 lectures.) 3. Autonomic Nervous System (12 lectures) - Reduce 2 lecture: Adrenergic Drugs (5hr) - Reduce 1 lectures: Cholinergic Dugs (6hr) 4. Cardiovascular System (11 lectures) 5. Anti-Inflammatory Agents (8 lectures) 6. Hypoglycemics (2 lectures) 7. Antihistamines (1 lecture) 8. Ulcers (1 lecture)	Themes: 1. Drug Metabolism (6 lectures) 2. Acid-base properties and bio-membrane penetration (2 lectures) 3. Autonomic Nervous System (12 lectures) 4. Cardiovascular System (12 lectures) - Add 1 lecture: Direct Vasodilators(1hr) 5. Anti-Inflammatory Agents (8 lectures) 6. Hypoglycemics (2 lectures) 7. Antihistamines (1 lecture) 8. Ulcers (1 lecture) 9. Add 1 lecture: Phosphodiesterase Inhibitors (1 lecture)	Themes: 1. Drug Metabolism (8 lectures) - Remove: introduction (1hr) - Add 1 lecture: Oxidation I – III (3hrs.) - Add 1 lecture: Conjugation I – III (3hrs) - Add 1 lecture: Factors Affecting Drug Metabolism (1hr) 2. Acid-base properties and bio-membrane penetration (2 lectures) 3. Autonomic Nervous System (12 lectures) 4. Cardiovascular System (12 lectures) 5. Anti-Inflammatory Agents (8 lectures) 6. Hypoglycemics (2 lectures) 7. Antihistamines (1 lecture) 8. Ulcers (1 lecture) 9. Add 1 lecture: Phosphodiesterase Inhibitors (1 lecture)
Delivery: Lectures: 41 hr Recitation: 28 hrs	Delivery: Lectures: 42 hrs Recitation: 28 hrs	Delivery: Lectures: 43 hrs Recitation: 28 hrs Pre-Exam Tutorial: 2 hrs	Delivery: Lectures: 43 hrs Recitation: 28 hrs Pre-Exam Tutorial: 2 hrs.	Delivery: Lectures: 45 hrs Topic/Case Discussions: 24 hrs Case Presentation: 6 hrs	Delivery: Lectures: 45 hrs Topic/Case Discussions: 24 hrs. Case Presentation: 6 hrs.

Assessment:	Assessment:	Assessment:	Assessment:	Assessment:	Assessment:
Exam 1 – Exam 6 (each worth 1/6 of 100%)	Presentation: 10% Quizzes):10% Participation: 10% Midterm Exam (MCQ's): 30% Final Exam (MCQ's): 40%	Presentation: 10% Quizzes: 10% Participation: 10% Midterm Exam (MCQ's): 30% Final Exam (MCQ's): 40%	Attendance: 10% Quizzes: 10% Presentation: 10% Midterm Exam (MCQ's): 30% Final Exam (MCQ's): 40%	Attendance: 5% Quizzes: 10% Case Presentation: 15% Midterm Exam (MCQ's): 30% Final Exam (MCQ's): 40%	Quizzes: 15% Case Presentation: 15% Midterm Exam (MCQ's): 30% Final Exam (MCQ's): 40%

AJPE
Accepted Draft

Table 5. Progress Test Results with External Benchmarking (p – value < 0.05 is statistically significant).

Students	Academic Level	No. of Students	Grade Mean (%)	Grade SD (%)	P-Value
KSAU-HS Pharm.D. Male Students	P1	35	37.37	6.17	0.001
	P2	20	48.30	5.12	
	P3	11	49.36	7.27	
	P4	14	55.71	8.67	
KSAU-HS Pharm.D. Female Students	P1	31	39.13	5.246	0.001
	P2	27	52.78	6.852	
	P3	25	54.04	6.828	
P1 Male Students vs. Benchmark 1	COP	35	37.37	6.174	0.001
	QU	15	29.60	6.926	
	KFU	24	32.71	5.982	
P1 Female Students vs. Benchmark 1	COP	31	39.13	5.246	0.001
	QU	31	29.32	5.231	
	KFU	56	35.18	4.809	
P2 Male Students vs. Benchmark 1	COP	20	48.30	5.121	0.001
	QU	37	37.73	7.523	
	KFU	19	37.58	7.121	
P2 Male Students vs. Benchmark 2	COP	20	48.30	5.121	0.001
	QU	37	37.73	7.523	
	KFU	19	37.58	7.121	

P2 Female Students vs.	COP	27	52.78	6. 852	
Benchmark 1	QU	37	34.70	8. 445	0.0 001
Benchmark 2	KFU	25	42.80	6. 014	0.0 001
P3 Male Students vs.	COP	11	49.36	7. 270	
Benchmark 1	QU	43	43.67	7. 517	0.0 28
Benchmark 2	KFU	17	41.06	7. 798	0.0 12
P3 Female Students vs.	COP	25	54.04	6. 828	
Benchmark 1	QU	90	42.82	6. 582	0.0 001
Benchmark 2	KFU	52	46.65	7. 901	0.0 001
P4 Male Students vs.	COP	14	55.71	8. 686	
Benchmark 1	QU	43	45.44	8. 212	0.0 001
Benchmark 2	KFU	30	46.83	8. 875	0.0 06

Table 6. Progress Test Results with External Benchmarking (p – value < 0.05 is statistically significant).

Academic Level		Gender	No. of Students	Response Rate (%)
First Semester	P1	Male	37	100.00
		Female	29-33	87.88-100.00
	P2	Male	19	95.00
		Female	30-33	90.91-100.00
	P3	Male	13	92.86
		Female	22-23	88.00-92.00
Second Semester	P1	Male	37	100.00
		Female	29-33	87.88-100.00
	P2	Male	16-19	80.00-95.00
		Female	30	90.91
	P3	Male	13	92.86
		Female	20-21	80.00-84.00
Survey Domain		Gender		Rating out 5 (Mean ± SD)
First Semester	The beginning of the course (Preparation)	Male		3.69 ± 0.26
		Female		3.58 ± 0.32
	What happened during the course (Delivery)	Male		3.62 ± 0.28
		Female		3.43 ± 0.32
	Perceived impact on student development	Male		3.61 ± 0.32
		Female		3.50 ± 0.35
	Overall course evaluation	Male		3.59 ± 0.08
		Female		3.45 ± 0.16
Second Semester	The beginning of the course (Preparation)	Male		3.78 ± 0.20
		Female		3.75 ± 0.30
	What happened during the course (Delivery)	Male		3.80 ± 0.20
		Female		3.53 ± 0.29
	Perceived impact on student development	Male		3.85 ± 0.21
		Female		3.73 ± 0.33
	Overall course evaluation	Male		3.64 ± 0.03
		Female		3.50 ± 0.11

Figure 1. Average Evaluation Rating Out of 5 for the Overall Course Evaluation in the Course Evaluation Survey.

