Strategic initiatives to maintain pharmaceutical care and clinical pharmacists sufficiency in Saudi Arabia

Abdulkareem M Albekairy¹,², Nabil Khalidi²,
Abdulmalik M Alkatheri¹,², Khalifa Althiab¹,², Shmeylan Alharbi¹,²,
Saleh Aldekhael¹,², Amjad M Qandil³,⁴ and Bandar Alknawy⁵,⁶

Abstract

Objectives: The shortage of clinical pharmacists in Saudi Arabia has limited the full implementation of pharmaceutical care in most of its hospitals. The National Guard Health Affairs hospitals. This work discussed the Department of Pharmaceutical Care, and the King Saud Bin Abdulaziz University for Health Sciences College of Pharmacy four initiatives that were planned in 2009–2010 to develop and recruit clinical pharmacists, practitioners, or faculty.

Methods: The combined initiatives were aimed at (1) instituting a 4-year clinical skills development career ladder, (2) expanding the National Guard Health Affairs postgraduate residency program, (3) offering scholarships to qualified pharmacy graduates to pursue the PharmD degree and a PGY-1 residency training in the United States, and (4) recruiting non-Saudi clinical pharmacists educated and trained in the United States to ameliorate the current shortage of practitioner.

Results: The current number of clinical pharmacists practicing at the National Guard Health Affairs at central region is 24, most of whom are Board Certified by the American Pharmacists Association Board of Pharmacy Specialties.

Conclusions: The four initiatives, based on current trends, suggest that 60–65 positions will be added by 2017–2018, barring attrition. Saudi Arabia and many developing countries will continue to experience a shortage in clinical pharmacists due to the high demand for clinical pharmacy services. A multifaceted approach is recommended to address the problem.

Keywords
Clinical pharmacists shortage, Saudi Arabia, clinical pharmacy, career ladder, residency training, international faculty recruitment

Date received: 29 March 2015; accepted: 11 June 2015

Introduction

Saudi Arabia has recently experienced a serious shortage of clinical pharmacists related to the inability of local schools and hospitals to produce the clinical pharmacists it needs to carry on pharmaceutical care. Local pharmacy leaders were quite aware of the similar situation that the US pharmacy was in over the past 20 years; thus, they wanted to benefit from the American experience, the founders of pharmaceutical care, in dealing with this acute shortage over the least amount of time.

It was quite known that the US pharmacy profession witnessed an unprecedented shortage of community and institutional pharmacists which partially impeded their implementation of pharmaceutical care.¹ This was at a time...
when two professional practice degrees were still being offered in the United States by many colleges of pharmacy. Pharmacy career ladders were launched in the United States and offered pharmacists, without clinical experience or training, the opportunity to advance in rank and acquire competencies for the sophisticated clinical practice programs in their institutions. Career ladder programs also improved pharmacists’ morale and satisfaction. US schools dealt with the pharmacist shortage by expanding the number and enrollment of its professional degree programs. By 2010, the number of PharmD programs recognized by Accreditation Council for Pharmacy Education was about 50% more than in 2000, and 13,000 new graduates were projected to become available in 2015 compared to 7000 in 2001.

While the vacancy rates for clinical pharmacists in the United States are declining, the shortage of pharmacists in Saudi Arabia is a cause of many unmet health-care needs as in many other countries. This becomes concerning when one realizes that in the United States, 28% of the patients aged 65 years and above take at least five medications and one-third of children take at least one medication. Moreover, the continued shortage of pharmacists has contributed to increased medication errors according to published analysis and reports. Saudi Arabia is no different as it struggles to meet health-care needs in both its rural and its urban areas.

The United States, thanks to its comprehensive academic and postgraduate training infrastructure, managed to address the acute pharmacist manpower shortage, an option not readily available to Saudi Arabia as it will be explained later. The Ministry of National Guard-Health Affairs (NGHA) of Saudi Arabia had to explore long-term strategies to compensate for short staffing due to increasing demand for clinical services in existing and in newly NGHA-constructed hospitals.

As stated earlier, one of the primary challenges faced in our country is the lack of an adequate number of clinical pharmacists to meet its demand. A survey of the eight major hospitals in the city of Riyadh where most large hospitals congregate, showed that only 116 pharmacists perform clinical functions to a total of 8409 patient beds making a ratio of 1 pharmacist to 72 beds (unpublished results). The ratio of pharmacists in all categories to the general Saudi population is only 0.2:1000 compared to 0.773:1000 in the United States. This is four times below that of the United States which we consider as the gold standard to emulate. Saudi medical and surgical health providers, who mostly are graduates and trainees of North American health institutions, demand patient-centered, team-based direct patient care much like what they have experienced in their training. Regardless of the reasons for this shortage whether it is the expanding health-care system, internal turnover, or the inadequate supply of Saudi or American educated clinical pharmacists, it became quite clear that new strategies for clinical pharmacist development, recruitment, and appointment had to be developed. With only a limited number of Saudi baccalaureate-prepared pharmacists enrolled in US doctor of pharmacy programs and postgraduate residency training programs, the objective of the NGHA system was to consider alternate and simultaneous strategies to close the clinical pharmacy manpower gap.

In Riyadh, Saudi Arabia, the NGHA system includes King Abdullah Specialized Children Hospital, are a 1477-bed tertiary teaching hospitals, the first of which commenced operations in 1983. It is one of the five medical cities of the NGHA that are spread across regions of Saudi Arabia. The health system has been fully accredited by the Joint Commission International (JCI) since 2006. KAMC-Riyadh is considered one of the most advanced health-care providers in the region and is ranked fourth outside the United States. The Ambulatory Care and Primary Health-Care Services house medical, surgical, and pediatric specialty clinics; preventive health services including health education and behavioral modification to promote the adoption of healthy lifestyles; and home care services.

KAMC

The KAMC hospitals in Riyadh (KAMC-Riyadh), including the King Abdullah Specialized Children Hospital, are a 1477-bed tertiary teaching hospitals, the first of which commenced operations in 1983. It is one of the five medical cities of the NGHA that are spread across regions of Saudi Arabia. The health system has been fully accredited by the Joint Commission International (JCI) since 2006. KAMC-Riyadh is considered one of the most advanced health-care providers in the region and is ranked fourth outside the United States. The Ambulatory Care and Primary Health-Care Services house medical, surgical, and pediatric specialty clinics; preventive health services including health education and behavioral modification to promote the adoption of healthy lifestyles; and home care services.

KSAU-HS

KSAU-HS was established in 2005 on the campus of the NGHA. It houses the colleges of Medicine, Dentistry, Pharmacy, Public Health and Health Informatics, Applied Medical Sciences, Science and Health Professions, and Nursing. It is the first university in the Middle East to specialize in health sciences.

Clinical pharmacy programs in Saudi Arabia and at KAMC

Although the first college of pharmacy in Saudi Arabia was established in 1959 and granted baccalaureate degrees in pharmacy, clinical pharmacy practice was not introduced in the country until the mid-1970s. However, the first Saudi postgraduate residency program was established in 2000 as a 2-year training program post baccalaureate degree. This was updated in July 2012 by the Executive Council of Saudi Commission of Health Specialties to a 3-year program equivalent to American PGY-1 and PGY-2. Once fulfilled, the graduate is classified as a clinical pharmacist. The program is centrally under the auspices of the Saudi Commission for Health Specialties (SCHS), the official local accreditation body for health training. The training of residents takes place in eight-member hospitals that meet the Council’s standards for postgraduate residency training programs. Each hospital program is managed by its respective local residency advisory committee and led by a program director. The
SCHS manages the combined programs through four major committees: the Central Pharmacy Residency Training Committee, the Exam and Acceptance Committee, the Site Accreditation Committee, and the Program Accreditation Committee. Up to mid-2014, only one postgraduate residency program at King Faisal Specialized Hospital, Riyadh, Kingdom of Saudi Arabia (KSA), was accredited by the American Society of Health-System Pharmacists (ASHP). As of September 2014, the ASHP has accredited two other residency programs, both of which are at the NGHA.

KAMC-Riyadh introduced its clinical pharmacy program in 1989. By 2002, the first batch of baccalaureate-prepared residents concluded their residency training and assumed clinical pharmacist positions. The clinical pharmacy program initially rendered services in parenteral nutrition, pharmacokinetics, intensive care, organ transplantation, and nephrology and initiated the publication of a departmental newsletter. Clinical services were then expanded in 1992 to include a Drug Information and Poison Control Center and pediatric clinical pharmacy services. By 2002, the clinical pharmacy services at KAMC-Riyadh covered most clinical services in its hospital with a combination of national and foreign clinical pharmacists. Currently, the clinical work force is composed of 24 clinical pharmacy staff and associate clinical pharmacists. These staff members provide clinical pharmacy services to nine medical-surgical specialties, each containing 2–9 patient care areas. Each area has been assigned one or more clinical pharmacists or specialists along with pharmacists who are in the career ladder program (second, third, or fourth year; Table 1).

### Methodology

#### Setting

**Department of pharmaceutical care.** An integral part of the KAMC hospitals, the department of pharmaceutical care has a closed formulary with an annual drug budget of more than US$102,000,000. It operates a large centralized area and 11 satellites, of which 7 are in the inpatient area and 4 in the outpatient area. Their total workload is 700,000 physician orders and 243,000 prescriptions per year. Two of its nine intravenous compounding rooms are USP chapter 797 compliant and generate 2,327,000 bags of large- and small-volume parenterals, including parenteral nutrition and chemotherapy preparations. Of the 450 departmental full-time equivalents, 206 are licensed pharmacists, of which a total of 24 are clinical pharmacists (10), clinical pharmacy specialists (11), or associate clinical pharmacists (3).

#### Task force formation

The Department of Pharmaceutical Care at KAMC-Riyadh and its affiliated KSAU-HS College of Pharmacy formed a task force of senior departmental leaders and clinicians to propose workable long- and short-term strategies for meeting the clinical pharmacists' shortage at the NGHA hospitals.

#### Task force recommendations

The task force was charged with proposing a rigorous career ladder track for pharmacists who are selected and willing to enroll in such a program. The task force was also asked to suggest other strategies to address the clinical pharmacists shortage.

The task force proposed a career ladder that took into consideration both academic and professional prerequisites for clinical pharmacists. The steps that were suggested complied with the NGHA hospital human resource guidelines and the department of pharmaceutical care career ladders for non-clinical departmental staff (senior pharmacist; pharmacists I and II; and pharmacy technicians I, II, and III). The program’s timetable and progress criteria were also detailed for
clinical pharmacists and clinical pharmacy specialists. The proposal was submitted to the NGHA Corporate Specialty Board for Pharmacists and Pharmacy Technicians, the regulatory body that oversees pharmacy practice within the NGHA system and subsequently to the higher administrative authorities of the NGHA. This board includes four directors of pharmacy (from the hospitals in the NGHA system), four assistant directors (representing operational and clinical divisions), two clinical supervisors, staff development coordinator, staff pharmacist, physician, member from credentialing and skills management, and representatives from training and development, an external department. The proposal was approved, and the program officially commenced in 2009 (Table 2).

In addition, the task force recommended increasing the number of residents in its postgraduate residency program (PGY-1) and creating up to five scholarships a year for pharmacy baccalaureate graduates with high academic ranking to apply to PharmD programs and graduate degree or fellowship programs in the United States. To manage the shortage of clinical pharmacists for the short term, the task force recommended continued recruitment of American trained clinical pharmacists.

**Career ladder curriculum and required competencies.** It was determined that for the graduates of Saudi PharmD or MS in clinical pharmacy programs, a 4-year training curriculum would be necessary. The task force created a list of clearly defined criteria and competencies required for enrollees to progress from the pre-entry level to associate pharmacist years 1, 2, and 3 (Tables 2 and 3). Competencies were designed with increasing complexity, commensurate with each level.

In the first preparatory year, and after successfully completing a competency examination and interview, selected clinical pharmacist candidates undergo the first year of clinical training and evaluation during which they are classified as “on probation” for the first 3 months. As the year progresses, clinical performance is closely supervised by the preceptor. If a trainee fails the probationary period, the assessment committee may recommend removal from the program and reinstatement in the pharmacist’s previous staffing position. Otherwise, the enrollee progresses to finish year 1 of training. The monthly assessments continue until the end of the training year. Once the candidate passes all evaluations, he or she is recommended to move to the next level, associate clinical pharmacist 1. This same process of assessment of clinical practice, together with evaluations of teaching, precepting, and conducting research (where applicable), continues for the next 3 years, enabling the candidate to move to the clinical pharmacist level at the successful conclusion of the third year. The trainee is then provided with the responsibilities, status, and salary of a clinical pharmacist.

**Entry level assessment tool.** A committee of senior clinical pharmacist specialists, who were also the teaching faculty of the pharmacology and therapeutics course at the KSAU-HS

---

**Table 2. Criteria that career ladder pharmacists must meet to move up to the next level.**

| Qualifications | Pre-career ladder screening and assessment (pharmacist I) | Year 1 associate clinical pharmacist | Year 2 associate clinical pharmacist | Year 3 Associate clinical pharmacist |
|----------------|----------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Curriculum     | Staff pharmacist I: BS or PharmD or MS (clinical pharmacy). No postgraduate training | Passed screening tests of previous year | Passed year 1 | Passed year 2 |
| Preceptor      | Clinical pharmacists specialists | Clinical pharmacists specialists | Clinical pharmacists specialists | Clinical pharmacists specialists |
| Assessment     | Competency examination; interview; 12 monthly rotation evaluations | 12 monthly rotation evaluations; service, teaching, and research progress evaluation | 12 monthly rotation evaluations; service, teaching, and research progress evaluation | 12 monthly rotation evaluations; service, teaching, and research progress evaluation |
| Salary adjustment at the year end | Basic staff pharmacist salary; no incremental increase | Salary increase of 25% | Merit salary increase | Salary increase of 20% |
| Number of applicants | 6 candidates reached this level | 8 candidates reached this level | 6 candidates reached this level | 6 candidates reached this level |

CE: Carrier Ethernet.

*Leading to clinical pharmacist appointment.*
school of medicine, was charged with designing three sets of multiple choice and case-based examination questions from an examination bank of questions they had established earlier. These competency assessment examinations were validated by a diverse group of practitioners, varied in difficulty, and were developed for administration to enrollees at the end of the first year of the career ladder program. Each of the 100-question tests was designed to be administered over a 2-h period, and enrollees were expected to pass each test with a minimum of 70%. The competency examination addressed a variety of topics including Critical Care, Infectious Diseases, Internal Medicine, Cardiology, Nephrology, Gastrointestinal Disorders, Pediatric, and Oncology.

**Recruiting preceptors.** A core of clinical pharmacist specialists who were graduates of accredited US programs (PharmD, PGY-1, PGY-2, or fellowship), most board certified in pharmacotherapy, was recruited to design and run the program. These clinical pharmacist specialists were also members of the assessment committee that oversaw the conduct of the program and assessed the performance of candidates in accordance with the established criteria. No external validation was sought to the assessment of candidate performance.

**Designing and supporting continuing education programs.** To support the continuous professional development of clinical pharmacists at all levels of training or practice, the department of pharmaceutical care planned weekly continuing education programs. It also planned and conducted regular workshops according to a yearly curriculum in which attendees, trainees, and practicing pharmacists can receive continuing education credits. Workshops were conducted by the clinical staff of the pharmaceutical care department in collaboration with the KSAU-HS College of Pharmacy. In addition, the American College of Clinical Pharmacy (ACCP) provided review courses on advanced pharmacotherapy and antithrombotic treatment as a part of the curriculum.

**Enrolling candidates.** Every July, the department of pharmaceutical care nominates a limited number of its staff pharmacists for enrollment in the career ladder program. To qualify, each candidate must be a graduate of an accredited school of pharmacy in Saudi Arabia or abroad and hold a doctor of pharmacy degree or a master’s degree in pharmacy or in clinical pharmacy. He or she must also pass a pharmacy competency entry examination on pharmaceutical care pertaining to medical and surgical specialties, public health, genomics, and pharmacokinetics. Finally, the candidate must successfully complete a group interview with the members of the assessment committee.

**Expanding postgraduate residency programs**

The 3-year SCHS Saudi Pharmacy Residency Program is divided into two stages: the first stage is 2 years in length equivalent to post-PharmD PGY-1 residency in the United States, and the second stage is a 1-year residency training equivalent to PGY-2 residency in the United States. The first year of the first stage develops the basic skills and knowledge and enables the resident to function in various operational pharmacy practice areas. This is followed by more focused clinical training in diverse patient care areas in the second year. The department of pharmaceutical care, following recommendations of the career ladder task force, initiated a plan to slowly increase the number of candidates accepted into the NGHA PGY-1 postgraduate residency program over the next few years. The department has also introduced the NGHA PGY-2 postgraduate training in some clinical specialties to enable graduates to be appointed as clinical pharmacist specialists (consultants).

**Establishing the PharmD scholarship program**

Realizing that the implementation of the career ladder program and the expansion of the residency program would require at least 4 years to yield any results, the NGHA established a goal to place up to 10 qualified Saudi bachelor graduates in US PharmD programs annually. This was designed to benefit all NGHA hospitals in Saudi Arabia. This effort facilitated the process of educating and training future Saudi clinical pharmacists and expedited the process of clinical and research mentorship from the US academic institutions who accepted NGHA candidates for admission.20

Using this approach, scholarship applications were accepted from academically qualified NGHA pharmacists or distinguised pharmacy graduates who are willing to work...
for the NGHA system and/or the KSAU-HS College of Pharmacy in the future. Those applicants selected for positions in the college of pharmacy undergo a year of academic and professional training as teaching assistants during which they are trained on preparing syllabi, delivering lectures, engaging in research, and participating in hospital rounds with a clinical faculty member. While serving as teaching assistants, the candidates are interviewed by a panel of KSAU-HS administrators and representatives of US colleges of pharmacy who have agreed to consider NGHA scholarship applicants. Once the PharmD degree is obtained, the Saudi graduates are expected to seek PGY-1, and preferably PGY-2, training in the United States, returning to NGHA upon completion of those programs.

**Recruiting foreign clinical pharmacists educated and trained in North America**

Because each of the previous approaches to educate and train clinical pharmacists requires substantial time for the practitioners to fully acquire the necessary skills, the Department of Pharmaceutical Care adopted a strategy to actively recruit foreign clinical faculty and practitioners for both the hospital and the college of pharmacy. This helped in meeting immediate clinical practice needs while the strategies described previously were implemented. However, the NGHA recently added three more specialty hospitals on the KAMC-Riyadh campus which will increase total bed capacity in the near future to 2400 beds. This is expected to further exacerbate the NGHA's clinical pharmacist shortage.

**Results**

Since the implementation of this multifaceted program between 2009 and 2015, over 40 internal and external pharmacists applied to the career ladder program, took the competency examinations, and interviewed with the assessment committee. Of these, 30 pharmacists were accepted in the 4-year program of which 6 completed the 4-year program and were promoted to clinical pharmacists by 2015, 6 are in year 3, and 8 are in year 2 of the program, while 6 have been enrolled in year 1 of the career ladder, and, unfortunately, 4 departed from the program.

Residency positions have also increased from 2 in 2010 to 14 in 2013, yielding two clinical practitioners in 2013, with eight more who completed the program in 2014. The scholarship program has sponsored a total of 30 students at four US universities. The first batch of three PharmD or PGY-1 trained pharmacists will join the faculty and clinical staff in 2015. Based on the current enrollment, 27 practitioners will also join the clinical staff and college faculty in 2015–2018.

In addition, the pharmaceutical care department and KSAU-HS was successful in recruiting handful of foreign clinical pharmacists who are educated and trained in the United States.

Furthermore, the NGHA PGY-1 postgraduate residency program has been accredited by the ASHP in September 2014 in Riyadh and Jeddah.

**Discussion**

In Saudi Arabia, the health-care expansion and the simultaneous construction of general and specialty hospitals in recent years necessitates the implementation of state-of-the-art clinical pharmacy services and the adoption of updated medication management systems.

While the department of pharmaceutical care at KAMC-Riyadh now employs 24 clinical pharmacists, it projects that it will need more than double that number of staff within the upcoming 5-year period. Not having sufficient clinical pharmacist manpower to implement clinical pharmacy services, the Department of Pharmaceutical Care at the NGHA resorted to the four-pronged strategy presented earlier to expand its clinical pharmacy workforce over the upcoming 5 years.

Pharmacy career ladders, especially those leading to the advancement of staff pharmacists to clinical and managerial roles, are structured programs that provide various levels of professional development within an organization. Such programs are based on fundamental principles, competencies, and/or levels of responsibility related to the practice of clinical pharmacy in which no immediate change in job description or professional title is introduced until the program is successfully concluded. These programs evolve as a result of either job dissatisfaction among staff and clinical pharmacists, such as stagnant pay and lack of opportunities for advancement, or due to a chronic shortage of clinical pharmacists. The ACCP 2010 white paper, “Rewards and Advancements for Clinical Pharmacy Practitioners,” quoted clinical pharmacists as yearning for, work–life balance, challenging positions, and opportunities for professional advancement as the most important factors for a successful career. ACCP encouraged pharmacy managers and administrators to develop effective systems of rewards and advancements such as career ladders that will benefit the clinical pharmacist, provide competent practitioners, and limit the untoward effect of turnover and staff shortage and also emphasized the importance of establishing pharmacist competencies.

It appears then that many factors may dictate the development as well as the execution of pharmacy career ladders to overcome a variety of challenges while promoting the development of relevant competencies. If the shortage is not corrected, as we project from our implemented career ladder program and the other described strategies, it will have a profound adverse effect on Saudi college of pharmacy academic programs for teaching and placing students in training sites which in turn may limit the ability of colleges to enroll and adequately prepare a larger number of PharmD students. Resorting to hiring unskilled new pharmacists in clinical roles without credible academic and professional preparation is not an option since this will not allow the provision of
clinical pharmacy services. The rationale for the recruitment and clinical career ladder establishment at KAMC-Riyadh can be attributed to two factors. The first factor is hospital expansion and clinical pharmacist shortage which was caused by the increase in bed capacity, growing patient population, increase in the diversification of the clinical sites, and the establishment of KSAU-HS. The second factor is job dissatisfaction, which was caused by inadequate pay and benefits and lack of advancement opportunities.

We observed that pharmacists in Saudi Arabia had the same sentiments of dissatisfaction as their American counterparts, which necessitated our development of approaches similar to those implemented in the United States. However, we used a more multifactorial approach that was conducted over a longer period of time to ensure that graduates will fully meet the expectations of clinical pharmacists within the NGHA. The NGHA planning task force, together with US leaders in clinical pharmacy, strongly believed that promoting staff pharmacists to clinical pharmacists without a structured development program, or without an enrollment in an accredited postgraduate training program, would fail to attain the desired outcomes. The task force also asserted that the career ladder program would have limited impact on the existing pharmacists’ shortage due to the required time to complete the process. Based on the enrollment in this program over the past 4 years, we estimate that it is likely to net a total of not more than 20 additional clinical pharmacists by 2017.

The department of pharmaceutical care’s annual recruitment of residents is variable, based on the pool of available candidates and their qualifications. Prior to the task force action, only two residents were accepted each year. In the past 4 years, 15 residents joined the program and committed to be employed by the department after successfully completing the program. Therefore, all 15 are expected to be functioning as clinical pharmacists by 2017. The ASHP accreditation of this program has undoubtedly increased the interest of future applicants.

Colleges of pharmacy in Saudi Arabia graduate a limited number of baccalaureate pharmacists and more recently PharmD graduates. The curricula tend to be a hybrid of American and foreign programs. Unfortunately, these Saudi programs do not focus on providing essential training in Introductory and Advanced Pharmacy Practice Experience courses as required by Accreditation Council for Pharmacy Education (ACPE), and their clinical pharmacy instruction and training tend to be provided by academicians who do not maintain consistent clinical practices. Moreover, sixth-year Saudi PharmD students tend to round by themselves in designated Saudi hospitals without any preceptor, other than the medical team. The “clinical” nonrounding faculty may meet with the rounding students to discuss various clinical and patient-specific topics. The consequence of this approach is suboptimal clinical experience and feedback, a feeling of professional dissatisfaction often expressed by today’s Saudi graduates. This forced the NGHA with its affiliated and newly established KSAU-HS College of Pharmacy in 2010 to continue to rely on recruiting US-trained clinical pharmacist faculty while it continues to await the outcome of its other strategic initiatives. NGHA had also contracted with a US college of pharmacy that enables the newly established KSAU-HS College of Pharmacy to teach the US college’s curriculum utilizing the NGHA or KSAU-HS clinical pharmacy practitioners and faculty, together with the invited US faculty. KSAU-HS College of Pharmacy has also designed its own Introductory Pharmacy Practice Experience (IPPE) and Advanced Pharmacy Practice Experience (APPE) courses such that they are compliant with ACPE standards even though ACPE does not accredit programs outside the United States. ACPE has only recently started certifying international programs under standards that are less rigid than the accreditation standard for US colleges with only a few programs certified so far. The NGHA or KSAU-HS has continued to support BS and PharmD Saudi graduates pursuit of US PharmD degrees in US colleges of pharmacy. It is anticipated that 27 PharmD or PGY-1 trained clinical pharmacists will join both the department of pharmaceutical care and the college of pharmacy within the period of 2015–2018.

The Saudi pharmacy profession has in the past depended on bachelor-prepared foreign recruits to support its retail pharmacy sector and the pharmaceutical industry. This was due to the limited number of Saudi colleges of pharmacy and their limited student enrollment. A scarce number of US-trained Saudi clinical pharmacists were employed in various hospitals including those of the NGHA. With the subsequent boom in Saudi health-care program development and the massive construction of hospitals and medical centers that are modeled after the American health-care system, a severe shortage of clinical pharmacists has ensued that could only be partially alleviated through the recruitment of foreign, US-trained clinical pharmacists. The dependence on non-Saudi clinical pharmacists remains significant. Despite their value to the implementation and maintenance of clinical pharmacy services during this chronic shortage, their stay in Saudi Arabia tends to be limited. Hence, the department of pharmaceutical care and KSAU-HS College of Pharmacy have instituted active recruitment programs. For the period of 2010 and beyond, seven clinical pharmacists were recruited by the NGHA from outside Saudi Arabia, with the expectation that this number will double by 2016 (barring attrition).

When the outcomes of these initiatives are pooled, the NGHA or KSAU College of Pharmacy will potentially realize a net increase in clinical pharmacy practitioners and faculty of about 60–65 positions over the next few years. While our initiatives are solidly maintained and supported, graduates’ commitments, future plans, and professional aspiration may change.

It is interesting to note that the United States and Saudi Arabia suffered the same initial shortage in clinical pharmacists at different times and shared some of the same triggers for that shortage. However, the United States was able to
reduce the impact of this phenomenon within about a decade.\textsuperscript{7,24} Substantial growth in the number of colleges of pharmacy, increased student enrollment, and enhanced clinical faculty recruitment all contributed to the US effort. Hospital pharmacies have responded to the shortage by expanding postgraduate residency programs and intensifying the clinical training of its staff. This happened while simultaneously increasing its operational efficiencies and increasing automation and advanced information technology. All this was done with the diligent facilitation of their respective associations and accreditation agencies. However, Saudi Arabia (and probably the rest of the developing world) lacks the infrastructure to effectively reverse the clinical pharmacists’ shortage in the short term. Crucial limitations include a relatively small number of colleges of pharmacy with limited clinical faculty and clinical training, clinical practice that is still being defined and controlled by nonpractitioners in the Ministry of Health, and a scarce number of ASHP-accredited residency programs. This has encouraged senior leadership in the NGHA and its affiliated new college of pharmacy to adopt the four approaches described above for preparing and employing clinical pharmacists at a pace commensurate with the development of the modern Saudi health-care system. When the NGHA system established the affiliated KSAU and its six health-care colleges, it did so based on the observation that such steps will be necessary to eventually produce the Saudi practitioners vital to fully support Saudi health care.\textsuperscript{25} The NGHA or KSAU-HS concern is that Saudi Arabia, and other developing countries, should avoid compromising the quality of patient care, and the scope and effectiveness of the pharmacy teaching and training programs, due to an insufficient number of practitioners and faculty. Despite the arduous initiatives pursued, we believe that these steps are vital to ensuring quality care for Saudi patients in the future. We also believe that such initiatives can be started elsewhere in developing countries who find themselves in similar situations to those in Saudi Arabia by utilizing the locally and reasonably priced professional skills rather than depending on the expensive foreign facilitation and assistance.

\textbf{Acknowledgements}

We acknowledge the advice and feedback provided by Michael S. Maddux, PharmD, FCCP, Executive Director, American College of Clinical Pharmacy.

\textbf{Declaration of conflicting interests}

This article is an original work that was never presented in any format anywhere. The authors declare that they had no conflict of interest in pursuing this project and in the statements they made in this article.

\textbf{Funding}

No funding was received from any source for this project or article preparation.

\textbf{References}

1. Hepler CD and Strand LM. Opportunities and responsibilities in pharmaceutical care. \textit{Am J Hosp Pharm} 1990; 47(3): 533–543.
2. Smith JE, Sheaffer SL and Frey BM. Clinical career ladders: Thomas Jefferson University Hospital. \textit{Am J Hosp Pharm} 1989; 46(11): 2263–2267.
3. Meyer JD, Chrymko MM and Kelly WN. Clinical career ladders: Hamot Medical Center. \textit{Am J Hosp Pharm} 1989; 46(11): 2268–2271.
4. Barbaccia JG and Mowrey D. Clinical career ladders: the Washington Hospital Center. \textit{Am J Hosp Pharm} 1989; 46(11): 2276–2279.
5. Wills TM and Garing TL. Clinical career ladders: St. Vincent Hospital and Health Care Center. \textit{Am J Hosp Pharm} 1989; 46(11): 2283–2285.
6. Brown D. From shortage to surplus: the hazards of uncontrolled academic growth. \textit{Am J Pharm Educ} 2010; 74(10): 185.
7. American Association of Health-System Pharmacists Research and Education. \textit{Pharmacy workforce: pharmacy forecast 2013–2017} (Foundation). http://www.nxtbook.com/ggsreprints/ASHPFoundation/d28547_ashpf_forecastbook2013/#/14 (accessed 26 May 2015).
8. U.N. Department of Economic and Social Affair. \textit{Health workers, international migration and development}. August 2010, http://www.un.org/esa/population/publications/popfacts/ popfacts_2010-2rev.pdf
9. Institute of Medicine (U.S.). \textit{Retooling for an aging America: building the health care workforce}. Washington, DC: National Academies Press, 2008.
10. Walton SM. The pharmacist shortage and medication errors: issues and evidence. \textit{J Med Syst} 2004; 28(1): 63–69.
11. Department of Health and Human Service. \textit{Report to congress: the pharmacist workforce: a study of the supply and demand for pharmacists}, http://bhpr.hrsa.gov/healthworkforce/reports/pharmaciststudy.pdf (accessed 25 March 2014).
12. Ministry of National Guard Health Affairs. King Abdulaziz Medical City in Riyadh, http://ngha.med.sa/ENGLISH/MEDICALCITIES/ALRIYADH/Pages/default.aspx (accessed 26 May 2015).
13. Ministry of National Guard Health Affairs. King Abdullah Specialist Children’s Hospital, http://ngha.med.sa/English/MedicalCities/ kcasch/Pages/operation.aspx (accessed 26 May 2015).
14. Asiri YA. Emerging frontiers of pharmacy education in Saudi Arabia: the metamorphosis in the last fifty years. \textit{Saudi Pharm J} 2011; 19(1): 1–8.
15. Al-Haidari KM and Al-Jazairi AS. Establishment of a national pharmacy practice residency program in Saudi Arabia. \textit{Am J Health Syst Pharm} 2010; 67(17): 1467–1470.
16. \textit{Residency training manual}. Riyadh, Saudi Arabia: The Saudi Commission for Health Sciences, 2011.
17. Barnett CW and Matthews HW. Teaching evaluation practices in colleges and schools of pharmacy. \textit{Am J Pharm Educ} 2009; 73(6): 103.
18. Walton SM, Knapp KK, Miller L, et al. Examination of state-level changes in the pharmacist labor market using census data. \textit{J Am Pharm Assoc} 2007; 47(3): 348–357.
20. Gums JG. Changing the direction of clinical pharmacy outside the United States: time to step up. Pharmacotherapy 2013; 33(2): 122–125.

21. Goodwin SD, Kane-Gill SL, Ng TM, et al. Rewards and advancements for clinical pharmacists. Pharmacotherapy 2010; 30(1): 114.

22. Burke JM, Miller WA, Spencer AP, et al. Clinical pharmacist competencies. Pharmacotherapy 2008; 28(6): 806–815.

23. Young D. Shortage of pharmacists may have contributed to patient’s death. Am J Health Syst Pharm 2002; 59(21): 2042, 2044–2045.

24. Aljadhey H. Experience and future of introductory pharmacy practice training in developing countries: example of Saudi Arabia. Am J Pharm Educ 2012; 76(10): 205.

25. Kenreigh CA and Wagner LT. The pharmacist shortage: where do we stand? http://www.medscape.com/viewarticle/521115 (accessed 30 October 2012).

26. American Pharmacists Association and American Society of Health-Systems Pharmacists. Concerns about the accelerating expansion of pharmacy education: time for reconsideration, http://www.ashp.org/DocLibrary/News/Accelerating-Expansion-of-Pharmacy-Education.aspx (accessed 20 February 2014).