INSTRUCTIONAL DESIGN AND ASSESSMENT

Home Medication Reviews in a Patient Care Experience for Undergraduate Pharmacy Students

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Objectives. To evaluate the effectiveness of conducting medication management reviews (MMRs) and home medication reviews (HMRs) on improving undergraduate pharmacy students' pharmaceutical care skills and clinical knowledge.

Design. Fifth-year bachelor of science in pharmacy students were enrolled in a structured course in which MMR cases based on real patient scenarios were completed, findings were discussed in groups, and comprehensive feedback was provided by course instructors. Each student was then asked to recruit a real patient through a community pharmacy and conduct an HMR.

Assessment. Students' pre- and post-course scores on the same MMR case improved significantly, with 84.6% of students passing the post-course assessment. Students also completed a new post-course MMR case and 74.8% received a passing score. Students' answers on a post-course self-assessment showed a significant improvement in their scores regarding knowledge and skills in conducting MMRs and HMRs.

Conclusion. Medication management reviews and home medication reviews are excellent tools for educating pharmacy students and providing them with needed actual clinical practice experience.

Keywords: medication management reviews, home medication reviews, community pharmacy, clinical pharmacy

INTRODUCTION

Medication management reviews are an excellent example of optimal pharmaceutical care delivery. Medication management reviews were originally conducted by pharmacists and have been a prime component of the expanded clinical services provided by pharmacists worldwide.¹⁻³ The purpose of the MMR is to maximize patients' care and benefit from their medication regimen.³ Medication management reviews have led to positive clinical outcomes, including reduction in adverse drug events, severity of illnesses, healthcare service costs, and emergency department contacts.⁴⁻⁷

At the Applied Sciences University (ASU) in Amman, Jordan, educators in the School of Pharmacy were aware that a disconnect existed between the classroom and the real patient-pharmacy care environment. All bachelor of pharmacy students at the university used to take a clinical

practice course in the second semester of their fifth year (final year), but the students consistently expressed dissatisfaction with the lack of actual practice experience during this course and with undergraduate studies in general. Hence, the instructors decided to incorporate home medication reviews (HMRs) into the course, in addition to theoretical MMR cases based on actual cases of local patients.

Home medication reviews are a subtype of MMRs in which patients are interviewed by a health professional in their own home. This was originally designed for pharmacists to recover relevant information from the patient's home that is of value and could otherwise be overlooked by health care professionals.³ The aim of designing this MMR/HMR course was primarily to provide pharmacy students with actual practice experience and to produce graduates capable of performing MMR/HMRs. This paper describes the development, implementation, and evaluation of this novel MMR/HMR course.

DESIGN

Beginning in the 2004-2005 academic year, pharmacy faculty members at the school designed a clinical

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practical course for students to learn how to resolve clinical cases with different treatment-related problems and therapeutic management issues. The course was conducted over 1 semester in the fifth year (final year) and involved students completing 6 fictional textbook patient profiles involving a variety of therapeutic topics and having a progressively increasing level of complexity. The course consisted of 3-hour classes held once a week for 10 weeks (Table 1). However, students who completed the course demonstrated a poor understanding of the concept of medication review.

Three months before the implementation of the MMR/HMR course, course instructors initiated weekly meetings to share ideas about needs, outcomes, objectives, strategies, and course content, and to plan for implementation during the 2009-2010 academic year. Course outcomes were developed to explain the value of the

MMR/HMR course. Expected outcomes of the course were for students to have increased knowledge of the management of various medical conditions, greater understanding of medication use and its interactions, better communication skills, improved ability to conduct an MMR, familiarity with where medicines should be stored, and increased awareness of how they could contribute to health promotion and pharmaceutical care.

The MMR process involved students analyzing relevant patient data provided by the course instructor, identifying treatment-related problems, and preparing a rational review in a written report that presented findings and recommendations regarding the identified treatment-related problems. This work was based on a previously described tool validated by the research team.^{5,8,9} The HMR process added to the MMR interview conducted by the students at the patient's home, and to patient education and counseling at the end of the process.

The learning objectives for the course included: (1) to learn and apply patient interview skills; (2) to practice basic MMR skills such as extracting necessary information from patient data, assessing medical literature relevant to a patient and his/her medications, and preparing recommendations to resolve and prevent identified treatment-related problems; (3) to demonstrate effective skills in writing a report presenting findings and recommendations with a rational drug therapy; and (4) to develop a professional identity through interacting with patients.

Ethics approval for this study was obtained from the Jordanian Ministry of Health and the Applied Sciences University Ethics Committees. Students, pharmacists in charge, and patients were asked to sign informed consent forms before participating in the study. The instructional design model involving analysis, design, development, implementation, and evaluation¹⁰ was used as a framework in designing the course. The systematic approach this model presents has been successful in similar training programs.¹¹

All fifth-year (final-year) students enrolled in the Clinical Pharmacy and Therapeutics program were required to participate in the MMR/HMRs course to successfully complete the course. The instructors decided early in the planning process to use problem-based learning (PBL) and small-group discussions as the primary educational methods for the classroom portion of the course, because these methods promote active, learner-centered education.^{12,13} Consequently, a 10-week classroom curriculum was introduced in which each student had to complete 6 MMRs, which were developed by the course instructor based on actual patient cases, to model the core elements of the MMR course.³ The course instructor presented the data used for the MMR cases in the

Table 1. Content of a Clinical Practical Course Featuring Medication Management/Home Medication Reviews

Week 1

Introduction to the course
Case A Pretest

Week 2

Phase 1 activities: classroom training and learning
Pseudo-patients MMR case
Therapeutic plan evaluation
TRPs identification
Suitable recommendation identification
Applying evidence based medicine
Group discussion of findings and recommendations
Learning Interviewing skills

Weeks 3-8

Performing 6 real patient MMR cases, one per week, via PBL scenarios.

Week 9

Phase 2 activities: Applying all skills previously learnt on MMR
Patient recruitment and interviews at the Community Pharmacy
Patient visit at home
HMR preparation following home visits
Submission of HMR cases for assessment

Weeks 10-11

Phase 3 activities:
Student group discussion of their individual HMR cases
Feedback on the HMR cases by the course instruction
Delivering instructor-approved counselling to the patient
Posttest Case A/Case B assessment (post-course assessment)

Week 12

Focus group interview

Abbreviations: MMR=Medication Management Review;
PBL=Problem Based Learning; HMR=Home Medication Review.

form of PBL scenarios. Students were not informed of the case content before class time, and were given a week after being given the content to work in groups on each case. The course instructor reviewed each MMR case and assigned a group grade. Initial analysis was performed to identify curriculum gaps related to the knowledge and skills required for the students to have to conduct MMR/HMRs. The course instructor assessed students' skills in completing 2 pseudo-patient MMR cases and conducting pseudo-patient interviews during the tutorials. During this phase, patient-interviewing skills, report writing, searching for therapeutic information, and scrutinizing the most critical recommendations were identified as curricular gaps. Hence, at the beginning of the semester, group tutorials were developed and implemented to address these 4 content areas to help students complete the MMR assignments successfully.

A full-time teaching facilitator was hired to coordinate and manage the MMR/HMR course, and to evaluate the students' progress regarding the submitted MMR assignments. The facilitator played the role of the patient, providing information and laboratory data regarding the MMR case to the students following their questions and requests only, as per the PBL structure.

Content knowledge related to medication and disease-state management provided in the therapeutic course delivered by one of the researchers provided the basis for recommendations made in the MMR cases. As additional assistance, selected readings pertaining to the MMR/HMR process were made available to the students.

Students were asked to identify treatment-related problems for each of the 6 MMR cases and discuss their findings and recommendations in a group of 4 to 6 students, then complete a report. Each report was reviewed and returned with extensive comments for each finding and recommendation by the course instructors. Written evaluation and feedback for the cases was based on previous published work.^{5,9} A skills-based scoring rubric was used to assess student performance based on the way students completed each of the sections within the MMR assignments (Appendix 1).

In the second week, students were taught basic communication skills necessary for establishing therapeutic relationships with patients. Initially students observed the course instructor demonstrate the steps involved in completing an HMR by interviewing a simulated patient. Students then performed role plays to practice different communication skills taught during the tutorials. The therapeutic content of the role play scenarios was basic so that students could focus on communication strategies. Students worked through the steps of MMR using a validated comprehensive classification tool for treatment-related

problems.⁸ Debriefing groups' discussions were held in class to allow the course instructor and students to discuss any perceived barriers that students might encounter in conducting HMRs. In preparation for conducting the HMRs, students received verbal in-class instructions from the course instructor on how to recruit patients and complete the HMR process.

Group discussions were held on a weekly basis to allow students an opportunity to apply specific skills needed to complete the MMR/HMR assignments. The discussions focused on identifications of treatment-related problems, developing an individualized patient MMR plan, and preparing an appropriately worded report (submitted to the course instructor) with the identified treatment-related problems and recommendations. Adult learning principles such as physical demonstration, peer assessment, and instant feedback were used in the group discussions.¹⁴ Weekly assessments based on the facilitator's observations were completed for each student to ensure that they were contributing to the class and gaining the skills needed.

Successful completion of the 6 pseudo-patient MMR cases (a grade over 75%) qualified students to go into the community to complete the HMR. Students were instructed to recruit 1 patient who met specific inclusion criteria from the community pharmacy where they worked as interns. In Jordan, students complete their internship by the end of their fifth year of the BPharm degree program. During their internship, students are allowed to counsel patients only under the direct supervision of a pharmacist.

Patients had to meet 1 of the following criteria for inclusion: taking 5 or more medications, taking more than 12 doses of medication per day, recently discharged from a hospital (in the previous 4 weeks), had significant changes made to their medication regimen in the last 3 months (ceasing and/or starting new medications for chronic conditions), had symptoms suggestive of an adverse drug reaction, or showed subtherapeutic response to medication treatment. Patients were recruited only if recent laboratory or pathology data were available. Students were required to recruit patients of their own gender who were 16 years of age or older. Students consulted the course instructor regarding whether the patient they planned to recruit met the inclusion criteria before completing the patient recruitment and starting the HMR process.

Students were asked to introduce themselves to the prospective patient recruit as pharmacy students and explain the study and its objectives before asking the patient to participate. If the patient agreed to participate, the student had to obtain the signature of the pharmacist

in charge on the patient recruitment form, and list the place of recruitment, time of recruitment, and information indicating that the patient met the inclusion criteria. The student obtained a signed informed consent form from the patient following recruitment and provided the patient's phone number(s) to the course instructor.

Each student conducted an initial brief patient interview (approximately 15 minutes) at the pharmacy prior to conducting the HMR. Using a form designed to collate data needed for the HMR process (template is available from the corresponding author upon request), students documented the patient's demographic information, past medical history, details of medical conditions, names of medications and medication history, dosage regimens, physical examinations, laboratory data, family and social (alcohol/smoker intake) history, and adherence to medications.^{5,8}

The student then went to the patient's home to complete the interview. Students were required to visit patients during daytime hours (between 9:00 AM and 3:00 PM) and inform the course instructor in advance of the visit place and time. The home interview was designed to take an hour, similar to the length of other clinical interviews. This period of time was typically sufficient for the student to ask questions regarding all medications found in the patient's drug cabinet and to complete the template.¹⁵ The student also collected laboratory data (eg, blood tests, blood pressure measurements) during the home visits. Students used the HMR submission form provided to them in their course materials to guide the home interview and to ensure that all of the necessary data were collected (form available upon request from the corresponding author). Students used the same validated comprehensive classification tool used for the MMR to complete the HMR and prepare the report with their findings and recommendations.⁸

During the HMR, students were allowed to deliver patient counseling and education to their recruited patients only within the scope of the pharmacist's role in Jordan (ie, correct medication use and lifestyle modifications), and appropriate to the patients' level of health literacy. The counseling session was unsupervised but the counselling plan was previously reviewed and approved by one of the course instructors. Students were not required to return to patients' homes for a second visit, but were allowed to perform follow-up counseling over the phone. Patients were not informed about any identified treatment-related problems.¹⁶

Strict process measures, such as random phone calls by the course instructor to the pharmacist in charge and recruited patients were made to assess for authenticity of the collected data. During the interview, students obtained the contact information for the patients' physicians

in case a serious treatment-related problem was encountered (only rarely). If a serious problem that required immediate physician intervention was found during the HMR, the student also obtained patient consent to contact the physician, and a researcher or the student under a researcher's supervision contacted the patient's physician(s).

Patient confidentiality was maintained throughout the process by having students assign a number to their patient and use the number in all subsequent references to the patient in reports. Students were prohibited from disclosing any patient identification information during their encounter, except to the course instructors.

The students had to submit a complete patient encounter log about their HMR, including a photograph of the medications used by the patient. Students received written review⁹ of their findings and recommendations, followed by a one-on-one discussion of the experience with the course instructor. The HMR assignment counted 25% of the final course grade and submission of the patient encounter log was required to satisfactorily complete the course.

The data template submitted by the student was screened by the researchers. Once the completed template was approved, the treatment-related problems for each patient were identified by students and findings and recommendations were presented in a report to the course instructor (similar format to that used for the MMR cases completed previously).

EVALUATION AND ASSESSMENT

The MMR cases prepared by the instructors to examine students' ability to assess treatment-related problems and prepare findings and recommendations reports were used as the primary assessment method for this course.¹⁶ On the first day of the course, students (n=133) were asked to complete a case (pretest case A).

For the posttest, students were asked to complete 2 cases (posttest cases A and B). At station 1, students (n=123) solved the same case as in the pretest, ie, case A. At station 2, students (n=133) conducted an MMR for a case that had not been discussed previously during the course (case B). To minimize pattern recognition, the questions in case A were reordered on the second test. Students had not been told how they performed on the pretest or what the correct answers were until all phases of the study were complete. The questions used in the posttest case B (unexposed case) were intended to be the same level of difficulty and reflect the same course objectives, such as assessment of patient clinical information and preparing the report with correct findings and recommendations, as those in case A (the exposed case).

For each student, a percentage grade for each case was calculated, with a passing grade being 50%. Then, mean scores and standard deviations on pretest and posttest were computed. The scores on the pretest and posttest case A were compared by a paired *t* test, and scores on posttest A and posttest B were compared by independent sample *t* test. All data were entered and analysed by the Statistical Package for Social Sciences (SPSS, version 17, Chicago, IL). Comparisons between groups were performed by independent sample *t* test or Wilcoxon signed rank test, and by chi square test for binary outcome variables. For all analyses, a *p* value of <0.05 was considered significant.

There was a significant difference between student performance on the pretest and posttest on case A in terms of mean test scores ($p<0.001$) (Table 2) and the proportion of students who passed the test (18.9% for the pretest vs 84.6% for the posttest ; $p<0.001$). The percentage of students who passed posttest case B (unexposed case) was significantly higher ($p=0.05$) than the percentage who passed pretest case A ($p<0.001$) (Table 2). The difference in the percentage of students who passed posttest case A and case B was not significant ($p=0.05$) (Table 2). Two subjective evaluations of the course impact also were used. The first included an 11-item survey instrument designed to determine students' self-assessment pre- and post-course of their basic skills, functional skills, and expected outcomes of the HMR performed by them (Table 3). The instrument used a Likert scale ranging from 1 equals strongly disagree to 5 equals strongly agree. The items included in this instrument were derived from the American Society of Hospital Pharmacists' Statement on Pharmaceutical Care (1993) and the American Society of Health-System Pharmacists' Guidelines on a Standardized Method for Pharmaceutical Care (1996).^{17,18} The instrument was pilot-tested and published previously.¹⁶

Several students were out of class on the day the post-course questionnaire was administered, resulting in fewer students completing it. In order to compare subjective assessment with objective assessment results, multiple

regression analysis was performed. The depended variable was posttest case B scores. Independent variables included all items in Table 3, post-course results.

Table 3 shows ranking of each of the items included in the students' subjective self-evaluation, pre- and post-course. All items of basic skills, functions, and outcomes of HMR conduct significantly improved at the end of the course. The students perceived an improvement in their skills of assessing patient's knowledge following patient interview, obtaining patient history, providing patient education, assessment of medical literature, and the application of these skills in an effective and timely manner ($p<0.001$). Functionally, the course increased students' confidence in their ability to integrate data to determine desired therapeutic outcomes, identify treatment-related problems, and provide recommendations to resolve them. In addition, the course has significantly improved the students' belief regarding their ability to contribute effectively in preventing/eliminating/curing patients' diseases/symptoms, improving patients' quality of life, and reducing the cost of treatment.

Multiple regression modelling of the dependent variable, posttest case B scores ($p=0.011$) showed: answering the subjective statement "I can identify actual and potential treatment-related problems" positively (ie, "agree") was strongly associated with having higher assessment scores ($p=0.036$).

The second subjective evaluation included the course satisfaction questionnaire completed only at the end of the course (Table 4). The proportion of respondents who agreed and disagreed with each item was evaluated, with a Likert scale measuring the level of agreement "strongly agree," "agree," "neutral," "disagree," or "strongly disagree" (scale out of 5 points). This questionnaire underwent content validation to ensure that the items assessed students' satisfaction with the course. Face validity was completed by having 15 fifth-year students (pharmacy students who were not yet attending this clinical pharmacy course) provide comments about the questionnaire contents, wording, and simplicity, and what could be done to improve the questionnaire. All of the students' comments were studied, and if appropriate, steps were taken to improve the questionnaire. The questionnaire was then approved by the school's investigational review board.

Findings from the Course Satisfaction Questionnaire (Table 4) showed that most students approved of course procedures. The majority of students were satisfied with the course instructor's involvement and the majority thought that instructor's comments helped them to improve the HMR process. Ninety-five percent of the students agreed or strongly agreed that the HMR overall was

Table 2. Objective Assessment: Students' Performance in Pretest Case A and Posttest Case A and Case B

Objective Assessment	N	Mean (SD)	Passed, %
Case A pretest	133	33.5 (19.7)	18.9
Case A posttest	123	62.9 (15.3) ^a	84.6 ^a
Case B posttest	133	60.6 (20.7) ^a	74.8 ^a

^a *p* values for case A pretest and case A posttest; case A pretest and case B posttest showed significant differences. Both comparisons ($p<0.001$, paired-sample *t* test for mean scores (out of 100%); $p<0.001$, chi-square test for proportions).

Table 3. Subjective Self-Assessment Precourse and Postcourse by Students Who Completed a Clinical Practical Course Featuring Medication Management/Home Medication Reviews^a

Area of Comparison	N	Precourse Score, Mean (SD)	Postcourse Score, Mean (SD)
Basic Skills			
I can obtain medical history to assess past experience from patient interview	132	2.9 (0.9)	4.2 (0.70)
I can provide patient education related to disease and medication	132	2.7 (0.9)	4.2 (0.7)
I can independently assess updated medical literature relevant to patient and his medication.	132	3.2 (0.9)	4.0 (0.8)
I can apply all the skills learned in effective and timely manner	132	3.2 (0.9)	4.0 (0.7)
Function			
I can integrate patient disease and drug data to determine desired therapeutic outcomes	126	2.7 (0.9)	4.0 (0.7)
I can identify actual/potential TRPs	126	2.6 (0.9)	4.1 (0.8)
I can provide recommendations to resolve TRPs	126	2.6 (0.9)	4.0 (0.7)
Outcomes- I believe that my HMR may help in:			
Curing patients' disease, and/or eliminate or reduce patients' symptoms and/or slow disease progress	131	2.9 (0.9)	4.0 (0.6)
Prevention of disease or symptoms	132	3.0 (0.9)	4.1 (0.7)
Improving patients' quality of life	130	3.3 (2.7)	4.2 (0.7)
Reducing the cost of treatment	131	2.8 (1.0)	4.0 (0.8)

Abbreviations: TRP=treatment-related problem.

^a Mean scores of a 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). Questionnaire repeated precourse and postcourse. $p < 0.001$ for all categories.

a useful learning experience, and 89% endorsed future inclusion of the HMR in the course.

At the end of the MMR/HMR course, an open invitation was extended to students to attend a focus group session to elicit comments about the MMR/HMR course,

feasibility of interviewing patients in their homes, and the impact of the course on students' learning.

Students (n=17) considered the MMR/HMRcourse an important component of pharmacy education. The feedback that students received from the course instructors

Table 4. Undergraduate Pharmacy Students' Responses on a Course Satisfaction Questionnaire (n=133)

By the end of the course:	Student Response ^a		
	Disagree/Strongly Disagree, No. (%)	Agree/Strongly Agree, No. (%)	Mean (SD)
I understood clearly what I needed to do to complete the HMR	6 (5.3)	125 (94.7)	4.1 (0.7)
I had the necessary skills and knowledge to provide accurate recommendations regarding the HMR case I conducted	22 (16.6)	111 (83.4)	3.8 (1.0)
I am satisfied with the accurate and comprehensive feedback provided to me about my HMR case	10 (7.6)	121 (92.4)	4.1 (0.9)
The comments from my lecturer helped me to identify improvements in my HMR skills	11 (8.3)	121 (91.7)	4.1 (0.9)
I found the whole HMR process very helpful in highlighting my role as a clinical pharmacist	16 (12.1)	116 (87.9)	4.1 (1.0)
Participating in the HMR assignments has helped me to deepen my therapeutics and clinical knowledge	9 (6.9)	122 (93.1)	4.1 (0.8)
The process of conducting HMRs and the resources made available for me during the tutorial enabled me to provide the needed feedback and recommendations	13 (10.0)	118 (90.0)	4.0 (0.8)
Overall, I found the HMR process a useful learning experience.	7 (5.3)	125 (94.7)	4.3 (0.8)
I would endorse the use of HMR in this course Unit of Study in the future	14 (10.8)	116 (89.2)	4.1 (0.9)

^a Mean score, 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). None of the students chose the "neutral" category.

regarding the MMR cases was effective and gave them the confidence they needed to complete the HMR. The home visit was perceived as essential to conducting an accurate medication review. Students identified many medications in the home visit that the patient had not mentioned during the pharmacy interview.

Understanding the broad role of the pharmacist in medication review and management was rated by the students as the central learning point of the course, followed by learning patient communication and interviewing skills. The HMR process impressed upon students that patients are real, with actual problems and medical situations that did not seem as straight forward as they had seemed when taught in class. Students also felt the course brought a needed sense of reality to the last stages of the pharmacy curriculum.

Students reported that attending continuing education programs annually after graduation would be essential to harness and improve their skills in conducting HMRs. Students appreciated the importance of their efforts, observing how small interactions could lead to considerable changes in a patient's life. Finally, students recognized the HMR process as an "excellent pharmaceutical care service" and, if implemented throughout the country, it would benefit patients, pharmacists, and the community.

DISCUSSION

The MMR/HMR course described in this study is the first designed to be implemented in an undergraduate therapeutics course. The course models the HMR service in operation in Australia.³ The course aims mainly at incorporating students in identifying treatment-related problems for outpatients, followed by the assessment, preparation, and provision of proper recommendations. The incorporation of the course in the fifth (final) year of the pharmacy curriculum demonstrated a strong potential in improving students' scholarly skills and interpretation towards their profession, which is becoming increasingly patient-centred.

This study presents a new approach to overcome the inherent challenge for pharmacy colleges and schools to provide actual practice environments to enhance students' classroom training.¹⁹ The MMR/HMR course can potentially resolve a long-standing problem of student dissatisfaction with the lack of minimal amount of supervised actual practice integrated into the undergraduate curriculum.

There are numerous published studies describing successful implementation of pharmacy practice modules in the undergraduate pharmacy curriculum^{16,20,21,22}; however, most of these were conducted in the hospital^{16,21} and

clinic setting.²² Although hospital and clinic settings can be suitable for providing pharmacy students with actual practice experience, the skills students learn in the community pharmacy setting clearly are more applicable to the career paths that the majority of undergraduate pharmacy students in Jordan will pursue and community pharmacy experiences would be more feasible for the majority of pharmacy colleges and schools to implement. In addition, some of the published modules could have potentially limited students' experience regarding patient interaction by not allowing them to perform their patient counseling except in the presence of more advanced students²⁰ or their preceptors.²¹ Student-patient interactions were limited further when their patient encounters involved only immediate, brief counseling regarding certain simple, predetermined pharmaceutical topics (nonprescription medications, health promotion, and disease prevention).²⁰ What could be even less effective as an "actual practice" opportunity is a module that involved students observing and reporting on an interaction between a pharmacist and a patient.²² However, some of the published modules that required students to perform a medication review, identify treatment-related problems, and prepare recommendations for a treatment plan for the patient also had flaws.^{16,20,21} For example, one module required students to conduct a medication review based on a patient's healthcare records without actually meeting the patient,²¹ while another had students present their findings and recommendations for treatment-related problems to their peers and course instructor but not to the patient, which limited the "patient care" aspect of these modules.^{16,20} These limitations could hinder students' appreciation of their efforts and the encouraging health outcomes their efforts may have led to for the patient. Hence, modules that expose students to actual practice in the community pharmacy and engage them in an experience that is relevant to their future professional practice are still needed. Besides, undergraduate educational modules looking at pharmaceutical services that can potentially and successfully be implemented in the local society are called for.^{23,24}

The MMR/HMR course was designed and implemented at the ASU School of Pharmacy incidentally and simultaneously with 2 separate programs implemented at US pharmacy colleges.^{11,19} The programs had numerous differences but were similar in concept, with each requiring pharmacy students to conduct medication reviews which included an extensive interview with an outpatient.

The MMR/HMR course was different from the other programs in numerous ways.^{11,19} First, it allowed the students to meet with the patient they recruited and follow up

with them individually rather than with another student¹⁹ or group of students¹¹; meet the patient at the patient's home rather than at a senior center¹⁹; recruit patients of all ages vs senior adult patients only,^{11,19} and engage students more educationally advanced (final-year vs first-¹⁹ and third-year¹¹ students). From another perspective, the MMR/HMR course is the only course evaluated not only by subjective but also objective assessments, namely examination cases prepared by the course instructors and completed by each student individually pre- and post-course. Other similar programs were either evaluated by survey instruments and feedbacks;¹⁹ or by survey instruments and take-home assignments completed by groups of students.¹¹ Stringent individual assessment is important as it visibly assesses the impact of the module on individual student level, prohibiting the involvement of other group members.^{16,25} Also, subjective assessment alone might be insufficient, especially with the likely social bias in student-instructor relationship.

Based on the focus group results and anecdotal observations, conducting the home visit was an extremely useful and valuable experience for students but initially this part of the assignment caused anxiety in some students. Some students expressed concerns about visiting the home of a "strange" patient. This concern was partially addressed by asking the students to visit patients of their gender and during working hours.

The time required for the students to conduct this course was within the course dedicated time table, and the course was considered feasible by the course instructors. Institutional cost increased only marginally (hiring a new facilitator with a clinical practicing experience). This study is not without limitations with respect to general findings. The evaluation of the course was conducted in 1 pharmacy school in Jordan using 1 cohort of fifth-year pharmacy students. However, no major differences were found in the educational setting from that of other schools that would prevent the generalization of the findings of this study.²⁶ In addition, it was not possible to have a control group of students who did not conduct the MMR/HMR in order to assess its effect, as all students enrolled in the course had to follow the same course design according to institutional ethics requirements. Allowing minimally trained students to go unsupervised into patients' homes raises concerns about student and patient safety, and may limit the transferability of the study. Strict process measures, which are described in the methodology of this study, were implemented to ensure student and patient safety.

CONCLUSION

Using combined medication management reviews and home medication reviews as an innovative tool for

educating undergraduate pharmacy students proved to be an effective means of providing them with needed clinical practice experience. This course development serves as an example of training and educating pharmacy students to take on the increasing responsibilities in delivering proper pharmaceutical care.²⁷ Future studies should look at the long-term impact of this educational course on the pharmacy practice delivered by graduates.

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