

## Original Research

# Medical and pharmacy students' attitudes towards physician-pharmacist collaboration in Kuwait

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Received (first version): 19-May-2017

Accepted: 12-Aug-2017

Published online: 25-Aug-2017

### Abstract

**Objective:** To assess and compare the attitudes of medical and pharmacy students towards physician-pharmacist collaboration and explore their opinions about the barriers to collaborative practice in Kuwait.

**Methods:** A cross-sectional survey of pharmacy and medical students (n=467) was conducted in Faculties of Medicine and Pharmacy, Kuwait University. Data were collected via self-administered questionnaire from first-year pharmacy and medical students and students in the last two professional years of the pharmacy and medical programs. Descriptive and comparative analyses were performed using SPSS, version 22. Statistical significance was accepted at  $p < 0.05$ .

**Results:** The response rate was 82.4%. Respondents had overall positive attitudes towards physician-pharmacist collaboration. Pharmacy students expressed significantly more positive attitudes than medical students ( $p < 0.001$ ). Medical students rated the three most significant barriers to collaboration to be: pharmacists' separation from patient care areas (n=100, 70.0%), lack of pharmacists' access to patients' medical record (n=90, 63.0%) and physicians assuming total responsibility for clinical decision-making (n=87, 60.8%). Pharmacy students' top three perceived barriers were: lack of pharmacists' access to patients' medical record (n=80, 84.2%), organizational obstacles (n=79, 83.2%), and pharmacists' separation from patient care areas (n=77, 81.1%). Lack of interprofessional education was rated the fourth-largest barrier by both medical (n=79, 55.2%) and pharmacy (n=76, 80.0%) students.

**Conclusions:** Medical and pharmacy students in Kuwait advocate physician-pharmacist collaborative practice, but both groups identified substantial barriers to implementation. Efforts are needed to enhance undergraduate/postgraduate training in interprofessional collaboration, and to overcome barriers to physician-pharmacist collaboration to advance a team approach to patient care.

### Keywords

Students, Pharmacy; Students, Medical; Education, Pharmacy; Education, Medical; Interprofessional Relations; Communication Barriers; Attitude of Health Personnel; Surveys and Questionnaires; Kuwait

## INTRODUCTION

The roles and responsibilities of the pharmacist have dramatically evolved in recent decades, with a transition from the traditional medication dispensing role to the modern delivery of direct patient care. Pharmaceutical care is a practice philosophy that was advanced in the 1990's to describe the responsible provision of medication therapy to patients to achieve definite outcomes that improve their quality of life.<sup>1,2</sup> More recently, practice models such as medication therapy management and comprehensive medication management have served as frameworks in

which pharmacists work collaboratively with patients, physicians, and other healthcare providers to provide team-based care that optimizes patient outcomes.<sup>3,4</sup>

To contribute to patient care effectively, pharmacists must collaborate directly with other health professionals and the patient to design, implement, and monitor a therapeutic plan.<sup>2,5</sup> Therefore, an integral component for the implementation of this practice is good interprofessional relationship between pharmacists and physicians.<sup>6</sup> However, physicians' negative attitudes have been among the challenges that faced pharmacists in their attempts to expand the scope of pharmacy practice.<sup>7</sup> Instead of viewing clinical decision-making as competitive, physicians and pharmacists must assume shared responsibility for decisions to achieve the best patient outcomes.<sup>8</sup> Pharmacists are educated and trained to take responsibility for the effectiveness and safety of medication therapy for patients.<sup>8</sup> Implementing deliberate physician-pharmacist collaborative practices is effective in improving patient care and clinical outcomes in both hospital and ambulatory care settings.<sup>9-14</sup> Pharmacists' partnership with physicians has been shown to improve the management of patients with chronic diseases such as hypertension<sup>11,14</sup>, heart failure<sup>15</sup> and diabetes<sup>16</sup>, while achieving significant cost savings.

Pharmaceutical care education has long been integrated into the curriculum of the Faculty of Pharmacy at Kuwait University.<sup>17</sup> The curriculum is designed to prepare

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graduates who have clinical knowledge and skills, as well as positive professional attitudes for patient care practice.<sup>17</sup> An earlier study among pharmacy students in Kuwait showed that pharmacy students hold positive attitudes towards pharmaceutical care, and they perceived themselves prepared to practice most of the pharmaceutical care competencies.<sup>17</sup> However, the implementation of pharmaceutical care practice in the Kuwait healthcare system has been slow and difficult.<sup>18,19</sup> Most pharmacists in Kuwait hospitals still perform traditional roles such as medication dispensing, filling drug orders, and stock control, with limited clinical roles.<sup>20</sup> Overall, the practice of pharmaceutical care in the healthcare system is sporadic and relies mainly on individual efforts made by some motivated pharmacists.<sup>21</sup>

Undergraduate medical and pharmacy educational programs should prepare graduates who are equipped with good communication skills and positive attitudes towards interprofessional collaboration. The attitudes of medical and pharmacy students towards physician-pharmacist collaboration have been investigated in some studies conducted in developed countries<sup>22,23</sup>, but no similar studies have been conducted in developing countries including Kuwait. Therefore, the present study was designed to assess the attitudes of medical and pharmacy students at Kuwait University Health Sciences Center (HSC) towards physician-pharmacist collaboration and to compare differences in attitudes between pharmacy and medical students at early and later stages of their academic careers. The study also sought to explore students' opinions about the potential barriers to physician-pharmacist collaboration in Kuwait.

## METHODS

### Study area

Kuwait is a Middle Eastern state that lies on the northeastern corner of the Arabian Peninsula. Healthcare professionals practicing in Kuwait have various educational backgrounds, as they include graduates from Kuwait, some Middle Eastern countries, and other countries such as the United Kingdom, other countries from Europe and North America and India. Faculties that have been established to prepare healthcare workforce include Faculty of Medicine, Faculty of Dentistry, Faculty of Pharmacy, Faculty of Allied Health Sciences and Faculty of Public Health, which are all located at Kuwait University HSC.

### Overview of medical and pharmacy curricula

Faculty of Medicine at Kuwait University was established in 1973 and remains the only medical school in Kuwait. The first batch of medical students graduated in 1983. Medical students receive their formal education over seven years and graduate with the Doctor of Medicine (MD) degree. The total number of enrolled students in the seven year medical program is almost 600 students. In 2005, the faculty underwent major transformation and adopted a system-based, hybrid problem-based curriculum, which is divided into three phases (phases I, II and III). Phase I consists of the two semesters of the first year of the medical curriculum (the pre-professional program). Phase II includes the semesters spanning from the second to fourth

year of the curriculum. At the end of Phase II program, students are awarded the degree of Bachelor of Medical Sciences (B. Med. Sc.). The Phase II program is structured as a system-based curriculum emphasizing students' self-directed learning and applying small group/problem-based learning, clinical skills labs and early clinical exposure. In Phase III (the clinical program), students undertake supervised training on the major medical specialties over three years on the wards and outpatient clinics of the general and specialized hospitals, including electives and a project. To graduate with the MD degree, students must successfully complete the B. Med. Sc. program and the clinical program. The Faculty has stated its mission as "to promote professional excellence, unfold knowledge of human life processes both in health and illness, encourage preventive health behaviour and promote healthy lifestyle, blend scholarship and service and follow a path of life-long learning, and share such learning with all those who come in contact including the community".

Faculty of Pharmacy at Kuwait University was established in 1996 and the first group of students graduated in 2002. Pharmacy students complete their formal education over five years and graduate with a Bachelor of Pharmacy (BPharm) degree. In the first year of study, pharmacy students join medical and dental students in pre-professional courses. Over the next four professional years, students undertake various pharmaceutical sciences courses, including pharmaceutical chemistry, pharmaceutics, pharmacology, therapeutics, and pharmacy practice. The philosophy and practice of pharmaceutical care feature in all professional years of the BPharm program. Students gain an in-depth understanding of pharmaceutical care principles early in the second year of the curriculum. They learn about the pharmaceutical care aspects related to the management of different disease states in the third through fifth professional years. This is delivered through lectures that are reinforced with practice-based laboratories, student presentations, and small group discussion on case studies. During the fourth and fifth years of study, students undertake experiential training (clerkships) supervised by professional pharmacy preceptors in various clinical settings including primary healthcare centers, community pharmacies, and general and specialized hospitals. The pharmacy curriculum is designed to develop students' fundamental knowledge in pharmaceutical sciences; communication skills; professional abilities to make rational, evidence-based clinical decisions; and to enhance their caring attitudes

	Frequency	%	
Gender	Male	91	23.6
	Female	294	76.4
Nationality	Kuwaiti	345	89.6
	Non-Kuwaiti	40	10.4
Faculty	Pharmacy	136	35.3
	Medicine	249	64.7
Educational level	First year students	147	38.2
	Fourth and fifth year Pharmacy students	95	24.7
	Sixth and seventh year Medical students	143	37.1

towards patients and positive attitudes towards pharmaceutical care practice. The Faculty has recently developed a two-year add-on Doctor of Pharmacy (PharmD) program to provide advanced clinical skills and practice experiences to deliver optimal pharmaceutical care services to patients.

### Study population

The study population consisted of four student cohorts: 1) pharmacy students completing the first common year; 2) medical students completing the first common year; 3) pharmacy students completing the last two (fourth and fifth) years; and 4) medical students completing the last two (sixth and seventh) years.

### Survey design and administration

Data were collected from students via a self-administered questionnaire at the end of the second semester of the academic year 2014-2015. The questionnaire was developed primarily from a validated survey instrument designed and used in the United States.<sup>22-24</sup> Prior to its administration, the questionnaire was pre-tested for

content, design, readability and comprehension with 15 medical and pharmacy students, and modifications were made as necessary. The final version of the questionnaire had three sections: 1) demographic and other characteristics, including age, gender, nationality, faculty (pharmacy or medicine), and educational level; 2) assessment of attitudes towards physician-pharmacist collaboration using the Scale of Attitudes Toward Physician-Pharmacist Collaboration (SATP<sup>2</sup>C)<sup>22-24</sup>, which includes 16 statements, each answered on a 4-point Likert scale (1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree); the possible range of scores is from 16 to 64, with a higher score indicating a more positive attitude towards collaborative relationships between physicians and pharmacists; and 3) assessment of students' level of agreement with a list of potential barriers that would hinder physician-pharmacist collaboration, using a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Students' responses were presented in descending order according to percentage agreeing on each barrier. This list was developed based on a literature review of previous studies regarding the barriers that can impede physician-

Table 2. The attitudes of first-year pharmacy (n=41) and medical students (n=106) towards physician-pharmacist collaboration.

Item	Response (%)				Median (IQR)	
	Disagree/ Strongly Disagree		Agree/ Strongly agree		P	M
	P	M	P	M		
1. A physician should be viewed as a collaborator and colleague with a pharmacist rather than his/her superior.	19.5	24.5	80.5	75.5	3.0 (1.0)	3.0 (0.25)
2. Pharmacists are qualified to assess and respond to patients' drug treatment needs.	0.0	15.0	100	85.0	4.0 (1.0)	3.0 (0.0)
3. During their education, pharmacy and medical students should be involved in teamwork in order to understand their respective roles. <sup>†</sup>	4.9	8.5	95.1	89.6	4.0 (1.0)	3.0 (1.0)
4. Pharmacists can contribute to decisions regarding drug interactions that can affect the patients.	7.3	13.2	92.7	86.8	4.0 (1.0)	3.0 (0.0)
5. Pharmacists should be accountable (responsible) to patients for the drug therapy they provide.	9.7	9.4	90.3	90.6	4.0 (1.0)	3.0 (1.0)
6. There are many overlapping areas of responsibility between pharmacists and physicians in drug treatment of the patients. <sup>†</sup>	14.6	11.3	83.0	87.7	3.0 (1.0)	3.0 (1.0)
7. Pharmacists have special expertise in counseling patients on drug treatment. <sup>†</sup>	4.8	16.0	95.2	82.1	4.0 (1.0)	3.0 (0.0)
8. Both pharmacists and physicians should contribute to decisions regarding the type and dosage of medicine given to the patients. <sup>†</sup>	21.9	11.4	75.6	88.6	3.0 (1.0)	3.0 (1.0)
9. The primary function of the pharmacist is to fill the physician's prescription without question. <sup>†</sup>	87.8	73.6	12.2	25.5	3.0 <sup>‡</sup> (1.0)	3.0 <sup>‡</sup> (2.0)
10. Pharmacists should be involved in making drug policy decisions concerning the hospital/pharmacy services upon which their work depends.	0.0	11.3	100.0	88.7	4.0 (1.0)	3.0 (1.0)
11. Pharmacists as well as physicians should have responsibility for monitoring the effects of drugs on the patients. <sup>†</sup>	4.8	18.9	95.2	79.3	4.0 (1.0)	3.0 (1.0)
12. Pharmacists should clarify a physician's order when they feel that it might have detrimental (harmful) effects on the patient. <sup>†</sup>	9.8	13.2	90.2	85.9	4.0 (1.0)	3.0 (1.0)
13. Physicians and pharmacists should be educated to establish collaborative relationships. <sup>†</sup>	7.3	7.5	90.2	92.4	3.0 (1.0)	3.0 (1.0)
14. Physicians should consult pharmacists for help with patients having an adverse reaction or refractory (not responsive) to drug therapy. <sup>†</sup>	7.3	13.2	90.2	86.8	4.0 (1.0)	3.0 (1.0)
15. Physicians should be made aware that pharmacists can help in providing the right drug treatment.	12.2	5.7	87.8	94.3	4.0 (1.0)	3.0 (1.0)
16. Interprofessional relationships between physicians and pharmacists should be included in their professional education programs.	7.3	17.0	92.7	83.0	4.0 (1.0)	3.0 (1.0)
Overall attitude					4.0 (1.0)	3.0 (0.0)

\* Responses rated on a Likert scale ranging from 1 = strongly disagree to 4 = strongly agree.

† Percentage may not total a 100% due to some missing responses.

‡ Reversed score for this negatively worded item.

M, medical students; P, pharmacy students.

Table 3. The attitudes of advanced pharmacy (n=95) and medical students (n=143) towards physician-pharmacist collaboration.

Item	Response (%)				Median (IQR)	
	Disagree/ Strongly Disagree		Agree/ Strongly agree		P	M
	P	M	P	M		
1. A physician should be viewed as a collaborator and colleague with a pharmacist rather than his/her superior.	1.1	3.5	98.9	96.5	4.0 (1.0)	3.0 (1.0)
2. Pharmacists are qualified to assess and respond to patients' drug treatment needs.	1.1	18.9	98.9	81.1	4.0 (1.0)	3.0 (0.0)
3. During their education, pharmacy and medical students should be involved in teamwork in order to understand their respective roles.	2.1	9.1	97.9	90.9	4.0 (1.0)	3.0 (1.0)
4. Pharmacists can contribute to decisions regarding drug interactions that can affect the patients.	1.1	9.1	98.9	90.9	4.0 (1.0)	3.0 (1.0)
5. Pharmacists should be accountable (responsible) to patients for the drug therapy they provide.	0.0	15.4	100	84.6	4.0 (1.0)	3.0 (0.0)
6. There are many overlapping areas of responsibility between pharmacists and physicians in drug treatment of the patients. †	6.3	12.6	92.6	87.4	3.0 (1.0)	3.0 (1.0)
7. Pharmacists have special expertise in counseling patients on drug treatment.	0.0	25.9	100	74.1	4.0 (1.0)	3.0 (1.0)
8. Both pharmacists and physicians should contribute to decisions regarding the type and dosage of medicine given to the patients.	1.1	18.2	98.9	81.8	4.0 (1.0)	3.0 (0.0)
9. The primary function of the pharmacist is to fill the physician's prescription without question.	83.2	69.3	16.8	30.7	3.0 ‡ (1.0)	3.0 ‡ (1.0)
10. Pharmacists should be involved in making drug policy decisions concerning the hospital/pharmacy services upon which their work depends.	3.2	18.2	96.8	81.8	3.0 (1.0)	3.0 (0.0)
11. Pharmacists as well as physicians should have responsibility for monitoring the effects of drugs on the patients.	4.2	22.4	95.8	77.6	3.0 (1.0)	3.0 (0.0)
12. Pharmacists should clarify a physician's order when they feel that it might have detrimental (harmful) effects on the patient.	1.1	10.5	98.9	89.5	4.0 (1.0)	3.0 (1.0)
13. Physicians and pharmacists should be educated to establish collaborative relationships.	2.1	12.6	97.9	87.4	4.0 (1.0)	3.0 (1.0)
14. Physicians should consult pharmacists for help with patients having an adverse reaction or refractory (not responsive) to drug therapy.	1.1	16.1	98.9	83.9	4.0 (1.0)	3.0 (1.0)
15. Physicians should be made aware that pharmacists can help in providing the right drug treatment.	1.1	14.0	98.9	86.0	4.0 (1.0)	3.0 (1.0)
16. Interprofessional relationships between physicians and pharmacists should be included in their professional education programs.	2.1	17.5	97.9	82.5	4.0 (1.0)	3.0 (1.0)
Overall attitude					4.0 (1.0)	3.0 (1.0)

\* Responses rated on a Likert scale ranging from 1 = strongly disagree to 4 = strongly agree.  
† Percentage may not total a 100% due to some missing responses.  
‡ Reversed score for this negatively worded item.  
M, medical students; P, pharmacy students.

pharmacist collaboration.<sup>2,6-8</sup> In addition, the final section included two open-ended questions to elicit participants' views on other possible barriers to physician-pharmacist collaboration and to provide suggestions to improve the working relationship between physicians and pharmacists in Kuwait. Only advanced medical and pharmacy students who completed the last two years of their programs were requested to provide their opinions regarding the barriers to collaboration. It was felt that first year students may not have sufficient experience with the healthcare system in Kuwait to assess these barriers.

To obtain a high response rate, the survey was distributed to students after major lectures and conducted on site. The purpose of the study was briefly explained to students and they were invited to participate in the survey, which took approximately 10 minutes to complete.

#### Ethical approval

Ethical approval for the study was obtained from the Human Ethical Committee, Health Sciences Center, Kuwait University. The study participants completed the questionnaire without providing any identification

information. They were assured of the confidentiality and anonymity of the responses provided.

#### Data analysis

Data were entered into the Statistical Package for Social Sciences (SPSS, version 22, Chicago, IL, U.S.A.), and descriptive and comparative analyses were conducted. The characteristics of study population and their responses about the barriers to collaborative practice were reported using frequencies and percentages. Respondents' attitudes towards physician-pharmacist collaboration were presented as percentages, median Likert scale rating (Interquartile Range [IQR]) and total attitude scores. The negatively worded item (statement number 9) was re-scored with the appropriate scale conversion so that the higher score on the item reflected more positive attitude towards a factor. The overall attitude was reported as median (IQR); the internal consistency for the 16 statements to determine attitude towards physician-pharmacist collaboration using Cronbach's  $\alpha$  was 0.80. Nonparametric tests were used for data analysis because the data were found to be not normally distributed. Mann-



Whitney test was used to evaluate the differences in median responses of participants to SATP<sup>2</sup>C between the student cohorts: 1) pharmacy students vs. medical students completing the first common year; and 2) advanced pharmacy students completing the last two (fourth and fifth) years vs. advanced medical students completing the last two (sixth and seventh) years. The Kruskal–Wallis test was used to evaluate the differences between the four groups of students. Statistical significance was accepted at  $p < 0.05$ .

## RESULTS

A total of 467 students were approached regarding study participation, 385 of whom completed the questionnaire (response rate of 82.4%). The median (IQR) age of respondents was 22.0 (6.0) years. More than one third of the total sample (38.2%) were first-year pharmacy and medical students surveyed at the end of the common year, 24.7% of the sample were fourth- and fifth-year pharmacy students, and 37.1% were sixth- and seventh-year medical students (Table 1).

Table 2 illustrates the responses of first-year medical and pharmacy students to the different items of the SATP<sup>2</sup>C. The participants agreed/strongly agreed on the survey statements, reflecting favorable attitudes towards physician-pharmacist collaborative relationships. The median attitude scores of respondents were equal to or above 3.0 out of a maximum score of 4 [positive attitude] for all the SATP<sup>2</sup>C items. This included the negatively worded item related to limiting the primary function of pharmacists to filling the physician's prescription without question. After being reversed, higher median attitude scores to this item indicated positive attitude towards collaboration [median (IQR) of 3.0 (1.0) by pharmacy students and 3.0 (2.0) by medical students]. The median

(IQR) total attitude score of pharmacy students towards SATP<sup>2</sup>C items, 58.0 (12.0), was significantly higher than that of medical students, 49.0 (10.0) ( $p < 0.001$ ).

Table 3 reports the attitudes of advanced medical and pharmacy students towards physician-pharmacist collaboration. Overall, both student groups agreed/strongly agreed on SATP<sup>2</sup>C items, indicating positive attitudes towards collaboration. Pharmacy students expressed significantly more positive attitudes towards collaboration, with median (IQR) total attitude score of 58.0 (11.0), compared to medical students, 49.0 (7.0) ( $p < 0.001$ ).

Respondents from the four student cohorts generally expressed positive attitudes towards physician-pharmacist collaboration. The overall median (IQR) total attitude score of respondents from the four cohorts was 58.0 (11.8). The first-year and advanced pharmacy students' median (IQR) score was significantly higher [58.0 (11.8)] than that of the first-year and advanced medical students [48.5 (9.0)] ( $p < 0.001$ ), as well as the overall mean (SD) total attitude score [56.3 (6.2) vs. 49.5 (7.5)]. There were no significant differences between the first-year and advanced pharmacy students, and the first-year and advanced medical students ( $p > 0.05$ ).

Medical and pharmacy students' opinions about the barriers to physician-pharmacist collaboration in Kuwait are shown in Table 4 and Table 5, respectively. Medical students agreed/strongly agreed that the most formidable barriers to establishing collaborative relationship between physicians and pharmacists were: pharmacists' physical separation from patient care area ( $n=100$ , 70.0%), lack of pharmacists' access to the patient's medical record ( $n=90$ , 63.0%), the professional culture and tradition of physicians assuming total responsibility for clinical decision-making ( $n=87$ , 60.8%), and lack of both physician and pharmacist education and training in interprofessional collaboration

Table 4. Advanced medical students' perceived barriers to effective physician-pharmacist collaboration (in descending order according to percentage agreeing) ( $n=143$ ).

Barriers to Effective Physician-pharmacist Collaboration	Students (%) who agreed/strongly agreed
1. Pharmacists being physically separated from patient care areas, which impairs communication with physicians.	100 (70.0)
2. Lack of pharmacists' access to the patient's medical record and the medical history, laboratory data, and other information.	90 (63.0)
3. The professional culture and tradition of physicians assuming total responsibility for clinical decision-making.	87 (60.8)
4. Lack of both physician and pharmacist education and training in interprofessional collaboration and teamwork.	79 (55.2)
5. Lack of physicians' trust in pharmacists' clinical abilities and their ability to provide direct patient care.	79 (55.2)
6. Inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice.	77 (53.8)
7. Physicians' concern that pharmacist patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes.	76 (53.1)
8. Organizational obstacles such as lack of support from administration or absence of healthcare policy defining the pharmacist's direct patient care role.	76 (53.1)
9. Inadequate education and clinical training about direct patient care in the pharmacy school curriculum.	67 (46.9)
10. Physicians' feeling insecure or fear of being criticized by other members of the healthcare team during collaborative practice.	64 (44.8)
11. Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige.	63 (44.1)
12. Lack of pharmacists' desire or willingness to change from medication dispensing to a direct patient care practice.	58 (40.6)
13. Lack of pharmacists' time to provide direct patient care because of dispensing duties.	48 (33.6)

Table 5. Advanced pharmacy students' perceived barriers to effective physician-pharmacist collaboration (in descending order according to percentage agreeing) (n=95).

Barriers to Effective Physician-pharmacist Collaboration	Students (%) who agreed/strongly agreed
1. Lack of pharmacists' access to the patient's medical record and the medical history, laboratory data, and other information.	80 (84.2)
2. Organizational obstacles such as lack of support from administration or absence of healthcare policy defining the pharmacist's direct patient care role.	79 (83.2)
3. Pharmacists being physically separated from patient care areas, which impairs communication with physicians.	77 (81.1)
4. Lack of both physician and pharmacist education and training in interprofessional collaboration and teamwork.	76 (80.0)
5. The professional culture and tradition of physicians assuming total responsibility for clinical decision-making.	75 (79.0)
6. Lack of physicians' trust in pharmacists' clinical abilities and their ability to provide direct patient care.	73 (76.8)
7. Inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice.	72 (75.8)
8. Physicians' feeling insecure or fear of being criticized by other members of the healthcare team during collaborative practice.	71 (74.7)
9. Physicians' concern that pharmacist patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes.	63 (66.3)
10. Lack of pharmacists' time to provide direct patient care because of dispensing duties.	59 (62.1)
11. Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige.	48 (50.5)
12. Lack of pharmacists' desire or willingness to change from medication dispensing to a direct patient care practice.	44 (46.3)
13. Inadequate education and clinical training about direct patient care in the pharmacy school curriculum.	39 (41.1)

and teamwork (n=79, 55.2%). On the other hand, pharmacy students agreed/strongly agreed that the most significant barriers were: lack of pharmacists' access to the patient's medical record (n=80, 84.2%), organizational obstacles such as the absence of healthcare policy to support the role of pharmacist in patient care (n=79, 83.2%), pharmacists' physical separation from patient care area (n=77, 81.1%), and lack of both physician and pharmacist education and training in interprofessional collaboration and teamwork (n=76, 80.0%).

In response to the open-ended questions, some participants reported additional barriers to collaboration. Among the perceived barriers by pharmacy students were inadequate pharmacy graduates' training on providing optimal clinical pharmaceutical services to patients and their lack of experience on the proper professional interaction with physicians, physicians' perception of the pharmacists as being 'drug dispensers' and their lack of awareness of what a pharmacist can contribute to patient care. On the other hand, some medical students reported that poor clinical experience of pharmacy graduates and physicians' fear of power conflict with pharmacists in situations that present overlapping expertise of the two professions in making therapeutic decisions might be potential barriers to interdisciplinary collaboration.

A number of participants forwarded suggestions to improve the physician-pharmacist working relationship. Both medical and pharmacy students recommended providing adequate shared learning opportunities for undergraduate medical and pharmacy students to appreciate the roles and responsibilities of each profession in patient care. Some pharmacy students indicated the urgent need to expand the scope of pharmacists' clinical practice in Kuwait, to foster physicians' awareness of the positive impact of pharmacist's role in patient care, and to establish an explicit legal framework that would clearly define the roles

and responsibilities of each profession, and hence govern physician-pharmacist collaboration in practice settings. Few medical students called for involving pharmacists in the provision of patient care services alongside physicians on hospital wards and in physicians' office practices, and for providing pharmacists with access to patients' medical information to help them deliver optimal clinical services to patients.

## DISCUSSION

Optimal physician-pharmacist interprofessional relationships and collaborative practice are fundamental to allow pharmacists to expand their scope of professional practice and provide effective patient care services. The present study assessed medical and pharmacy students' attitudes towards physician-pharmacist collaboration and their perceived barriers to implementing collaborative practice in Kuwait. This can provide useful insights to guide curricular improvement to prepare physicians and pharmacists who can provide collaborative care to patients in their future practices.

Our results showed that medical and pharmacy students in Kuwait expressed relatively positive attitudes towards physician-pharmacist collaboration, with pharmacy students expressing significantly more positive attitudes towards collaboration than medical students. This finding is consistent with the results of studies conducted in the United States<sup>22</sup> and Croatia.<sup>25</sup> In our study, pharmacy students surveyed at the end of the first year and the last two professional years (overall median (IQR) total SATP<sup>2</sup>C score was [58.0 (11.8)], and mean (SD) total attitude score was [56.3 (6.2)]) reported significantly more positive attitudes towards physician-pharmacist collaboration than their medical student counterparts (overall median (IQR) total SATP<sup>2</sup>C score was [48.5 (9.0)] and mean (SD) total

attitude score was [49.5 (7.5)] ( $p < 0.001$ ). In the study conducted by Winkle et al. in Midwestern University (the US), first-year pharmacy students' mean (SD) score was significantly higher [56.6 (7.2)] than that of first-year medical students [52 (6.1)].<sup>22</sup> In Croatia, a comparison between pharmacy and medical students of all years of the study programs at the University of Split School of Medicine showed that pharmacy students expressed more positive attitudes towards interdisciplinary collaboration than medical students [mean (SD) total attitude score of 56.2 (4.9) vs. 44.6 (6.2)].<sup>25</sup> As part of their professional culture, physicians are usually trained to be self-sufficient and individually responsible for their decisions and actions. Thus, they have traditionally assumed total responsibility for patient outcomes, while being reluctant to involve other practitioners in the clinical decision-making process.<sup>7</sup> Collaboration can be complicated by the fact that pharmacists providing direct patient care by managing medication therapy are expanding into roles traditionally held by physicians.<sup>2</sup> Thus, it is not surprising that medical students would express less positive attitudes towards collaborative relationships than would pharmacy students. These results are similar to studies in which physicians expressed relatively less positive attitudes towards physician-nurse collaboration than did the nurses.<sup>26,27</sup>

Despite the fact that the philosophy of pharmaceutical care has been integrated into the education and training of graduates of Kuwait University Faculty of Pharmacy, its implementation into actual practice has faced many obstacles, including lack of understanding of the practice by other healthcare professionals<sup>19</sup> and inadequate interprofessional relationships between physicians and pharmacists.<sup>7,8</sup> Lack of physicians' appreciation of pharmacy services has been among the obstacles to changing pharmacy practice in Kuwait.<sup>28</sup> In an earlier study conducted in Kuwait hospitals, physicians were found to be reluctant to accept pharmacists' provision of direct patient care.<sup>29</sup> In another study, hospital pharmacists reported lack of communication/coordination with physicians and lack of physicians' trust in pharmacists' abilities to be among the main barriers to the wide implementation of pharmaceutical care in Kuwait.<sup>19</sup> This poor interprofessional relationship among physicians and pharmacists should be a major concern of medical and pharmacy educators in Kuwait.

Health professions education (including medical and pharmacy education) must equip students with the knowledge, communication skills, attitudes, and behaviors to work collaboratively to provide optimal patient care.<sup>30</sup> The findings of this study indicate that both medical ( $n=79$ , 55.2%) and pharmacy students ( $n=76$ , 80.0%) identified lack of physician and pharmacist education and training in interprofessional collaboration and teamwork to be among the principal barriers to establishing effective physician-pharmacist collaboration. Even though the Faculties of Medicine and Pharmacy are located on the same Health Sciences Center campus, medical and pharmacy students learn together only in the first common year. During that time, students are taught together in pre-professional courses mostly using a passive, didactic teaching modality. Afterwards, students from each of the two professions learn in their own Faculty with limited interaction with

students from the other profession. Therefore, the current teaching strategies of undergraduate medical and pharmacy students warrant evaluation and improvement to provide graduates with the necessary communication skills and positive attitudes towards interprofessional collaboration.

In the present study, participants called for providing opportunities for interprofessional education (IPE) among undergraduate medical and pharmacy students to foster the development of collaborative working relationships among them as future practitioners. The World Health Organization identifies IPE as an essential educational strategy to prepare collaborative healthcare practitioners who have learned how to work in an interprofessional team and are competent to do so.<sup>30</sup> Ample evidence indicates that IPE aids in the development of effective collaborative practice among healthcare practitioners, which results in optimal utilization of health services and improves health outcomes.<sup>30</sup> Offering IPE opportunities to medical and pharmacy students at the undergraduate level and to physicians and pharmacists in the context of continuous professional development activities can assist in developing pharmacist-physician working relationships.<sup>31,32</sup> Many universities and academic healthcare centers in the USA<sup>33</sup>, Canada<sup>34</sup> and the UK<sup>35</sup> have long been implementing IPE programs in the education of healthcare students to enhance interprofessional collaboration and teamwork skills among their graduates.

A deliberate educational strategy must be carefully designed to offer undergraduate medical and pharmacy students in Kuwait interprofessional learning opportunities spanning the entire course of their academic study.<sup>17</sup> This can ideally be delivered using interactive teaching modalities starting from the earliest stages of their academic programs.<sup>17</sup> Medical and pharmacy students can undertake shared IPE courses with focus on communication and interpersonal skills, analysing ethical issues, and recognizing and appreciating the unique roles and responsibilities of each profession in patient care.<sup>17</sup> Later on during the course of their study, medical and pharmacy students can practice in mixed small groups that may include students from other healthcare professions on analysing and solving hypothetical patient case scenarios. This can be followed by practicing together in various clinical settings to deal with real patient cases during their experiential training. Students' engagement in such interactive IPE will enhance their teamwork skills, instil mutual respect, and foster collaborative attitudes as future healthcare professionals, with the ultimate goal of improving the quality of patient care.<sup>17</sup> Plans are currently underway to develop and implement an IPE curriculum among the various healthcare faculties at Kuwait University HSC. This curriculum will engage medical, pharmacy, and other healthcare students including dentistry and allied health students in joint IPE courses to enhance their collaborative practice and teamwork skills.

Interestingly, students from both programs had similar views regarding the most important barriers towards physician-pharmacist collaboration. Pharmacists' physical separation from patient care areas was perceived to be most significant barrier by medical students and was

ranked as the third-highest barrier by pharmacy students. Hospital pharmacists mainly perform medication dispensing and stock control inside the pharmacies with limited contact with physicians on the wards.<sup>20</sup> Because there is ample evidence of positive pharmacist impact on patient health outcomes<sup>9,15,32</sup>, those who have the necessary competencies should work closely with physicians in the hospital wards and in physicians' office practices in Kuwait to enhance patient care. This close contact will allow physicians to observe pharmacists performing clinical duties, thereby increasing their trust in pharmacists as reliable partners in providing optimal team-based patient care.<sup>29</sup>

In order to expand the scope of pharmacy practice in Kuwait, the Faculty of Pharmacy has recently developed a two-year add-on PharmD program that is offered to carefully selected graduates from the BPharm program. The Faculty has also future plans to achieve complete transition from the current BPharm program to an entry-to-practice PharmD program to meet the healthcare system demand for competent clinical pharmacists. Moreover, the Kuwait Ministry of Health has been sponsoring educational scholarships for Kuwaiti pharmacists to study abroad to attain the Master's degree in clinical pharmacy. The number of clinical pharmacists has been slowly growing in the country, and they have been introducing patient care services in their practice settings. In this study, medical students (n=87, 60.8%) rated the professional culture of physician assuming total responsibility for clinical-decision making to be among the most significant barriers to collaborative practice. As more PharmD-trained clinical pharmacists join healthcare outlets in Kuwait, they will strengthen clinical pharmacy practice while practicing alongside physicians. With time, physicians will gradually realize the benefits that pharmacists can bring to patient care, develop trust in their clinical abilities, and be more willing to allow them to participate in shared decision making. The expanded scope of pharmacy practice will also likely be professionally rewarding for the clinical pharmacists.

Lack of pharmacists' access to the patient's medical record was the top perceived barrier to physician-pharmacist collaboration by pharmacy students (n=80, 84.2%) and the second-most significant barrier by medical students (n=90, 63.0%). The implementation of pharmaceutical care services involves identifying, preventing, and resolving drug therapy problems.<sup>5</sup> To adequately deliver these services, pharmacists need access to patient records to evaluate clinical and laboratory data. In Kuwait, patients' medical and medication information are only available in the governmental hospitals and medical centers, but not in community pharmacy settings. Furthermore, in many hospitals in Kuwait, paper-based medical records are still used for data acquisition. In an earlier study among hospital pharmacists in Kuwait, pharmacists cited lack of adequate technology as one of the main barriers to pharmaceutical care implementation.<sup>19</sup> Health authorities in Kuwait are advised to enhance the application of health information technology, including implementation of the electronic health (eHealth) record system at all levels of healthcare delivery in Kuwait. The eHealth record system provides pharmacists with access to patient-specific health

information, including medication-related information, thereby facilitating the delivery of patient care services and enhancing practice efficiency.<sup>36</sup> The eHealth record system is currently used in a number of health centers within the primary healthcare sector and in some hospitals. The launching of a nation-wide eHealth network would provide pharmacists in all health settings with reliable access to patients' medical information. This can facilitate the delivery of effective and safe patient care services and enhance collaboration with physicians. To cope with this transformation in data management systems, medical and pharmacy students must be trained on the use of these electronic tools and the interprofessional communication necessary for their effective use.

Potential solutions to other perceived barriers to physician-pharmacist collaboration identified in this study include developing explicit national standard of practice, job descriptions and legal frameworks to define the roles and responsibilities of physicians and pharmacists in patient care to overcome organizational barriers, increasing the number of staff pharmacists and competent pharmacy technicians to free pharmacists' time to provide direct patient care, and providing incentives for pharmacists to provide direct patient care. The Faculty of Pharmacy and Kuwait Ministry of Health must collaborate to guarantee the proper recruitment and acceptance of graduates from the PharmD program and to initiate the systematic implementation of pharmaceutical care practice across the various healthcare settings.

#### Limitations

A possible limitation of this study is the students' self-reporting of attitudes towards physician-pharmacist collaboration. There is a potential for response bias by students because they could have provided socially desirable responses. A further limitation is the cross-sectional nature of the study that represented one point in time and, therefore, does not reflect any changes in students' beliefs over time in relation to physician-pharmacist collaboration. Despite these limitations, this study provides insights on the attitudes of medical and pharmacy students towards physician-pharmacist collaboration in Kuwait and the challenges to such collaboration from the perspectives of students. Future research is needed to explore physicians and pharmacists attitudes towards interdisciplinary collaboration. Another possible area of research could include evaluating the clinical and economic outcomes of any future collaborative practice among practitioners from the two professions in Kuwait.

#### CONCLUSIONS

Assessing medical and pharmacy students' attitudes towards physician-pharmacist collaboration can provide useful insights into educational and organizational strategies that would enhance future collaborative practices. Medical and pharmacy students at Kuwait University advocate interprofessional collaborative practice while also understanding the barriers to its adoption in Kuwait. However, pharmacy students expressed significantly more positive attitudes than medical students.



Among the most significant students' perceived barriers to collaboration were lack of pharmacists' access to patients' medical records, pharmacists' separation from patient care areas, organizational obstacles, physicians assuming total responsibility for clinical decision-making and lack of interprofessional education. There are opportunities for improvement in medical and pharmacy education to enhance students' training in interprofessional collaboration and teamwork. Health authorities and educational institutions in Kuwait must direct their joint efforts towards overcoming the identified barriers to such collaboration to foster broad implementation of team-

based care that leads to improved health outcomes for our patients.

#### CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest to disclose.

#### FUNDING

None.

## References

1. Hepler CD. The future of pharmacy: pharmaceutical care. *Am Pharm*. 1990;NS30(10):23-29.
2. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *Am J Hosp Pharm*. 1990;47(3):533-543.
3. Bluml BM. Definition of medication therapy management: development of professionwide consensus. *J Am Pharm Assoc* (2003). 2005;45(5):566-572.
4. Nace DK, Grundy P, Nielsen M. Patient-centered primary care collaborative (PCPCC). The patient-centered medical home: integrating comprehensive medication management to optimize patient outcomes resource guide, 2nd ed. Washington, DC: PCPCC; 2012.
5. American Society of Hospital Pharmacists. ASHP statement on pharmaceutical care. *Am J Hosp Pharm*. 1993;50:1720-1723.
6. Al-Taweel D, Awad A, Johnson BJ. Pharmacists' contributions to the delivery of pharmaceutical care to patients with type 2 diabetes in Kuwait. *Int J Diabetes Dev Ctries*. 2014;34(2):108-115. doi: [10.1007/s13410-013-0169-4](https://doi.org/10.1007/s13410-013-0169-4)
7. Berenguer B, La Casa C, de la Matta MJ, Martin-Calero MJ. Pharmaceutical care: past, present and future. *Curr Pharm Des*. 2004;10(31):3931-3946. doi: [10.2174/1381612043382521](https://doi.org/10.2174/1381612043382521)
8. Martin-Calero MJ, Machuca M, Murillo MD, Cansino J, Gastelurrutia MA, Faus MJ. Structural process and implementation programs of pharmaceutical care in different countries. *Curr Pharm Des*. 2004;10(31):3969-3985. doi: [10.2174/1381612043382549](https://doi.org/10.2174/1381612043382549)
9. Leape LL, Cullen DJ, Clapp MD, Burdick E, Demonaco HJ, Erickson JI, Bates DW. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA*. 1999;282(3):267-270. doi: [10.1001/jama.282.3.267](https://doi.org/10.1001/jama.282.3.267)
10. Kuo GM, Buckley TE, Fitzsimmons DS, Steinbauer JR. Collaborative drug therapy management services and reimbursement in a family medicine clinic. *Am J Health Syst Pharm*. 2004;61(4):343-354.
11. Carter BL, Ardery G, Dawson JD, James PA, Bergus GR, Doucette WR, Chrischilles EA, Franciscus CL, Xu Y. Physician and pharmacist collaboration to improve blood pressure control. *Arch Intern Med*. 2009;169(21):1996-2002. doi: [10.1001/archinternmed.2009.358](https://doi.org/10.1001/archinternmed.2009.358)
12. Hammad EA, Yasein N, Tahaineh L, Albsoul-Younes AM. A randomized controlled trial to assess pharmacist-physician collaborative practice in the management of metabolic syndrome in a university medical clinic in Jordan. *J Manag Care Pharm*. 2011;17(4):295-303. doi: [10.18553/jmcp.2011.17.4.295](https://doi.org/10.18553/jmcp.2011.17.4.295)
13. Tallian KB, Hirsch JD, Kuo GM, Chang CA, Gilmer T, Messinger M, Chan P, Daniels CE, Lee KC. Development of a pharmacist-psychiatrist collaborative medication therapy management clinic. *J Am Pharm Assoc* (2003). 2012;52(6):e252-e258. doi: [10.1331/JAPhA.2012.11215](https://doi.org/10.1331/JAPhA.2012.11215)
14. Hirsch JD, Steers N, Adler DS, Kuo GM, Morello CM, Lang M, Singh RF, Wood Y, Kaplan RM, Mangione CM. Primary care-based, pharmacist-physician collaborative medication-therapy management of hypertension: a randomized, pragmatic trial. *Clin Ther*. 2014;36(9):1244-1254. doi: [10.1016/j.clinthera.2014.06.030](https://doi.org/10.1016/j.clinthera.2014.06.030)
15. Gattis WA, Hasselblad V, Whellan DJ, O'Connor CM. Reduction in heart failure events by the addition of a clinical pharmacist to the heart failure management team: results of the Pharmacist in Heart Failure Assessment Recommendation and Monitoring (PHARM) Study. *Arch Intern Med*. 1999;159(16):1939-1945. doi: [10.1001/archinte.159.16.1939](https://doi.org/10.1001/archinte.159.16.1939)
16. Cranor CW, Bunting BA, Christensen DB. The Asheville project: long-term clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc* (Wash). 2003;43(2):173-184. doi: [10.1331/108658003321480713](https://doi.org/10.1331/108658003321480713)
17. Katoue MG, Awad AI, Schwinghammer TL, Kombian SB. Pharmaceutical care education in Kuwait: pharmacy students' perspectives. *Pharm Pract (Granada)*. 2014;12(3):411. doi: [10.4321/s1886-36552014000300002](https://doi.org/10.4321/s1886-36552014000300002)
18. Awad A, Al-Ebrahim S, Abahussain E. Pharmaceutical care services in hospitals of Kuwait. *J Pharm Pharm Sci*. 2006;9(2):149-157.
19. Katoue MG, Awad AI, Schwinghammer TL, Kombian SB. Pharmaceutical care in Kuwait: hospital pharmacists' perspectives. *Int J Clin Pharm*. 2014;36(6):1170-1178. doi: [10.1007/s11096-014-0013-z](https://doi.org/10.1007/s11096-014-0013-z)
20. Matowe L, Al-Kandery AS, Bihzad SM. Pharmacy in Kuwait. *Am J Health Syst Pharm*. 2003;60(15):1591-1592.
21. Kheir N, Al Saad D, Al-Naimi S. Pharmaceutical care in the Arabic-speaking Middle East: literature review and country informant feedback. *Avicenna*. 2013;2. doi: [10.5339/avi.2013.2](https://doi.org/10.5339/avi.2013.2)
22. Van Winkle LJ, Fjortoft N, Hojat M. Validation of an instrument to measure pharmacy and medical students' attitudes toward physician-pharmacist collaboration. *Am J Pharm Educ*. 2011;75(9):178. doi: [10.5688/ajpe759178](https://doi.org/10.5688/ajpe759178)

23. Hojat M, Spandorfer J, Isenberg GA, Vergare MJ, Fassihi R, Gonnella JS. Psychometrics of the scale of attitudes toward physician–pharmacist collaboration: A study with medical students. *Med Teach*. 2012;34(12):e833-e837. doi: [10.3109/0142159X.2012.714877](https://doi.org/10.3109/0142159X.2012.714877)
24. Hojat M, Gonnella JS. An instrument for measuring pharmacist and physician attitudes towards collaboration: preliminary psychometric data. *J Interprof Care*. 2011;25(1):66-72. doi: [10.3109/13561820.2010.483368](https://doi.org/10.3109/13561820.2010.483368)
25. Sesejca-Perisin A, Mestrovic A, Klinar I, Modun D. Health care professionals' and students' attitude toward collaboration between pharmacists and physicians in Croatia. *Int J Clin Pharm*. 2016;38(1):16-19. doi: [10.1007/s11096-015-0215-z](https://doi.org/10.1007/s11096-015-0215-z)
26. Garber JS, Madigan EA, Click ER, Fitzpatrick JJ. Attitudes towards collaboration and servant leadership among nurses, physicians and residents. *J Interprof Care*. 2009;23(4):331-340. doi: [10.1080/13561820902886253](https://doi.org/10.1080/13561820902886253)
27. Hansson A, Arvemo T, Marklund B, Gedda B, Mattsson B. Working together—primary care doctors' and nurses' attitudes to collaboration. *Scand J Public Health*. 2010;38(1):78-85. doi: [10.1177/1403494809347405](https://doi.org/10.1177/1403494809347405)
28. Al-Wazaify M, Matowe L, Albsoul-Younes A, Al-Omran OA. Pharmacy education in Jordan, Saudi Arabia, and Kuwait. *Am J Pharm Educ*. 2006;70(1):18.
29. Matowe L, Abahussain EA, Al-Saffar N, Bihzad SM, Al-Foraih A, Al-Kandery AA. Physicians' perceptions and expectations of pharmacists' professional duties in government hospitals in Kuwait. *Med Princ Pract*. 2006;15(3):185-189. doi: [10.1159/000092179](https://doi.org/10.1159/000092179)
30. The World Health Organization, 2010. Framework for action on interprofessional education and collaborative practice. Available from: [http://www.who.int/hrh/nursing\\_midwifery/en/](http://www.who.int/hrh/nursing_midwifery/en/) (accessed 15 April, 2016).
31. Zargarzadeh AH, Jacob S, Klotz RS, Khasawneh FT. Clinical pharmacists and basic scientists: do patients and physicians need this collaboration? *Int J Clin Pharm*. 2011;33(6):886-894. doi: [10.1007/s11096-011-9562-6](https://doi.org/10.1007/s11096-011-9562-6)
32. Gallagher RM, Gallagher HC. Improving the working relationship between doctors and pharmacists: is inter-professional education the answer? *Adv Health Sci Educ Theory Pract*. 2012;17(2):247-257. doi: [10.1007/s10459-010-9260-5](https://doi.org/10.1007/s10459-010-9260-5)
33. Aston SJ, Rheault W, Arenson C, Tappert SK, Stoecker J, Orzoff J, Galitski H, Mackintosh S. Interprofessional education: a review and analysis of programs from three academic health centers. *Acad Med*. 2012;87(7):949-955. doi: [10.1097/ACM.0b013e3182583374](https://doi.org/10.1097/ACM.0b013e3182583374)
34. Cameron A, Rennie S, DiProspero L, Langlois S, Wagner S, Potvin M, Dematteo D, LeBlanc V, Reeves S. An introduction to teamwork: findings from an evaluation of an interprofessional education experience for 1000 first-year health science students. *J Allied Health*. 2009;38(4):220-226.
35. Anderson ES, Lennox A. The Leicester Model of Interprofessional education: developing, delivering and learning from student voices for 10 years. *J Interprof Care*. 2009;23(6):557-573. doi: [10.3109/13561820903051451](https://doi.org/10.3109/13561820903051451)
36. Keller ME, Kelling SE, Cornelius DC, Oni HA, Bright DR. Enhancing practice efficiency and patient care by sharing electronic health records. *Perspect Health Inf Manag*. 2015;12:1b.