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# Attitudes, and Knowledge of Pharmacy and Medical/ Dental Students towards, and Barriers to Inter-Professional Education and Collaboration in the United Arab Emirates

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## Abstract

**Background:** Inter-professional collaboration (IPC) is necessary for the provision of patient care poor IPC has negative impact on the delivery of healthcare services and patient care.

**Objective:** Purpose of this study is to assess and evaluate the knowledge and attitude of final years' medical students toward IPC.

**Methods:** A cross-sectional study was designed, pre-piloted and distributed to final years' pharmacy, medical/ dental students in the University of Sharjah and Ajman University of Science and Technology (UAE).

**Results:** A total of 212 (70.7%) surveys have been received out of 250 targeted students, 3 of the surveys were excluded due to incomplete data. The response rate was 83.6%. The majority of the respondents were females (155; 75.2%), Arabs (156; 75.7%), medical and dental students (129; 61.7%), senior students (104; 51.5%) and were living with their families (133; 63.6%). More than half of the participants were between 21-23 years old (158; 76%) and were self-sponsored (155; 74.9%). Among the 209 students, 80 (38.3%) of them were pharmacy students and the rest were medical and dental students (129; 61.7%). In general students' attitudes towards inter-professional collaboration seem to be positive. The majority of students of both groups agreed that share common goals and objectives when caring for the patient, their roles are complementary to one another and an introductory IP experience would have a positive impact on their understanding of collaboration and teamwork. Again there was a general agreement among all students of the present barriers to effective inter-professional education and collaboration.

**Conclusion:** We conclude that some professional mandatory classes need to be common among the different health colleges. In addition, workshops should be implemented for pharmacy, medical, dental and nurse students as a sort of practical regular extracurricular activities or can be projected as a theatrical play.

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## Introduction

A plethora of studies clearly revealed the remarkable improvement in the delivery of healthcare services and consequently healthcare outcomes that can be achieved through inter professional (IP) collaboration (Guraya & Barr,

2018, Carlisle & Taing, 2021). According to the World Health Organization, IPE “occurs when two or more professions learn from each other regarding the effective collaboration and improvement of health outcomes”(WHO, 2010). In the light of the wise change in the role of the pharmacist from drug dispensing to patient care, the inclusion of the pharmacist as an essential member of the healthcare team becomes a necessity. The pharmacist can significantly contribute to the efforts of other healthcare professionals by counseling patients on their prescribed medications, the importance of drug adherence, advise on lifestyle and proper drug storage conditions. The pharmacist can also advise the prescribing physician on the availability of equally effective generic drug, drug interactions, and other aspects of the prescribed drug regimen. Management of chronic diseases while minimizing harm and improving therapeutic outcomes depends on the organized efforts of all professionals in the medical team. The pharmacist’s contribution to the management of chronic diseases such as diabetes and hypertension has been the subject of several studies that showed a positive impact for the pharmacist-led interventions (Hatah, Braund, Tordoff, Duffull, 2014; Cheema, Sutcliffe, Singer, 2014; Tan, Stewart, Elliott, George, 2014; Santschi et al., 2014)

Appropriate IP collaboration between healthcare team members requires positive attitude, respect and trust among members of various disciplines. This can be fostered through Interprofessional education (IPE). The latter enhances interdisciplinary collaboration and teamwork, and reduce barriers among health professionals (Guraya & Barr, 2018, Carlisle & Taing, 2021).

Inter-professional learning through undergraduate courses influences the knowledge of students and their appreciation of the roles and contribution of each other to the benefit of patients. The importance of IPE in health educational programs has been stressed by many national and international accreditation bodies such as in pharmacy education by the Accreditation Council for Pharmacy Education (ACPE, 2016). IPE also became the standard for the entry-level Pharmacy professionals (Olsen, Lupton-Smith, Rodgers, McLaughlin, 2021).

In the University of Sharjah, United Arab Emirates (UAE), the educational environment is ready to heavily embark on IP learning. Four colleges namely the medical, dental, pharmacy and health sciences are situated in one complex and the students share many elective courses, and scientific and extracurricular activities. The only courses shared by students of these colleges are few elective courses. The same applies to Ajman university in which there was only dentistry and pharmacy colleges. The pharmacy study plan is spread over 4 years as compared to 5 years in Sharjah. There is no official collaboration between the two universities. However, many researchers from both universities frequently collaborate in research projects. The objective of the present study was to evaluate the knowledge and attitude of pharmacy, medical and dental students of various aspects of IP education and also to explore their views about IP collaboration, and the barriers to IPE.

## Methods

### Study area

The University of Sharjah was established in 1997. However, the colleges of pharmacy (B. Pharm.), medicine (M.B.B.S.) and dentistry (B.D.S.) were established in the Medical and Health Sciences Complex in the year 2004 and were affiliated with colleges of Pharmacy and Medicine-University of Monash and college of Dentistry-University of Adelaide, Australia. The colleges adopt Problem Based Learning and Team Based Learning in addition to traditional lecturing and tutorials. In 2004, students of the three college have to enroll in a foundation year with common courses. However, later the system changed where pharmacy study plan was modified to include a separate first year pharmacy instead of the foundation year. The common courses that are usually shared by students of the three colleges are principally elective courses. The three programs are accredited by the Commission for Academic Accreditation (CAA) of the ministry of Higher Education of the United Arab Emirates (UAE).

The study plan of the colleges extends over 5 years (pharmacy), and 6 years (medicine and dentistry). The pharmacy curriculum includes basic and pharmaceutical sciences in addition to pharmacy practice and clinical pharmacy courses and experiential training. The college is, at present, applying for initial accreditation for a Pharm. D. program. Fourth year students of the Faculty of Pharmacy and Health Sciences at Ajman University were included in the study. At Ajman University, the pharmacy program extends over 4 years, with pharmacy practice and clinical pharmacy are taught at the advanced year. Basic and applied sciences are taught across the 4 years of the study plan Ajman University was chosen because of geographic location, accreditation, medium batch size and the approval to conduct the survey that was granted by the university's administration and the dean of the faculty of pharmacy. The college of Sharjah-medicine has adopted the module system where students are taught all the basic, applied and clinical courses related to a specific system weekly as one block. In such a way all courses are covered from first to fifth year then students have to do their hospital internship. In dentistry, basic and applied sciences are covered in the first two years in addition to some clinical subjects, the weight of which will increase as students advance to third, fourth and fifth years of the study plan, followed by an internship.

## Study population

The study population consisted of two student cohorts: 1) fourth and fifth year pharmacy students and 2) Fifth year medical and dental students. All students of these study years were targeted but not those of other study years, and as such no sampling was made.

The present cross-sectional study was conducted during the period of January -April, 2018 using a self - administered questionnaire that was developed by modification of a survey instrument designed and used in previously published study (Hatah, Braund, Tordoff, Duffull, 2014). Prior to its administration, the questionnaire was pre-piloted for face validity by distributing it to 3 fifth year dentistry students, 3 fifth year pharmacy students, 2 fifth year medical students and 4 pharmacy professors in the university of Sharjah and their comments and recommendations were considered in the final version of the questionnaire. The questionnaire consisted of 4 sections; the first dealt with questions covering demographic characteristics of the participants, including age, gender, college, year of study, ethnicity, accommodation and type of sponsorship. The second section covered questions on whether the students shared any common courses,

collaborated in research projects or graduation projects and their knowledge with regard to the prescription as a legal documents and the meaning of the term polypharmacy. The third section covered questions that assessed student's views of each other's as healthcare professionals and their attitudes towards future inter-professional collaboration. Separate questions were directed to and answered by each student's cohort. Some of the questions examined the views of students on some ethical issues such as their willingness to associate themselves with advertisement of pharmaceutical products and publicly criticizing other healthcare professionals. The last section questioned participants' views of the various barriers to their IP collaboration.

The questionnaire was distributed after class times with the supervision of a faculty after taking his/her permission. Two members of the research group, who conducted the study, were always present to distribute the questionnaire, clarify any misunderstood points as needed, insure the confidentiality of the participants' information and collect the returned filled-in surveys. The participant's consent was verbally obtained after brief explanation of the nature of the survey. The average time required to fill the questionnaire was estimated to be a maximum of 15 minutes.

## Ethical approval

All participants were assured of confidentiality and the survey was an anonymous one. Ethical approval was obtained from the Ethical Committee of the University of Sharjah (REC-18-02-12-02-S)

## Statistical analysis

Responses of the participants were encoded, and the data were analyzed using Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, version 20.0, Armonk, NY, IBM Corp). Three categories of the relevant responses (agree, neutral and disagree) were used. Descriptive analysis was used to calculate the proportion of each group of respondents who agreed, disagreed and were neutral with each statement in the questionnaire. Chi square test was used to identify any significant differences among the participants' demographics and responses regarding certain statements in the questionnaire with a significant level of  $p$  value  $< 0.05$ .

## Results

A total of 250 students were approached and invited to participate in the study but only 209 students voluntarily participated and completed the questionnaire producing a response rate of 83.6%. The questionnaire was filled by 80 pharmacy (P) and 129 medical/dental (MD) students. Females (155,74.2%) were more than male (51, 24.4%) participants and 156 (74.6%) were Arabs living with their families (133, 63.6%) and were self-sponsored (155,74.2%). The majority of students were in the age range of 20-24 years (Table 1).

**Table 1.** Demographic characteristics of participants

Criteria	Frequency (%), N= 209
<b>College</b>	
<ul style="list-style-type: none"> <li>Pharmacy</li> <li>Medicine/ Dentistry</li> </ul>	80 (38.3%) 129 (61.7%)
<b>Year of Study</b>	
<ul style="list-style-type: none"> <li>Fifth Year</li> <li>Fourth Year</li> <li>Missing Values</li> </ul>	104 (49.8%) 98 (46.9%) 7 (3.4%)
<b>Gender</b>	
<ul style="list-style-type: none"> <li>Female</li> <li>Male</li> <li>Missing Values</li> </ul>	155 (74.2 %) 51 (24.4 %) 3 (1.4%)
<b>Ethnicity</b>	
<ul style="list-style-type: none"> <li>Arab</li> <li>Non- Arab</li> <li>Missing Values</li> </ul>	156 (74.6%) 50 (23.9%) 3 (1.4%)
<b>Age</b>	
<ul style="list-style-type: none"> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>≥ 25</li> <li>Missing Values</li> </ul>	27 (12.9%) 42 (20.1%) 69 (33%) 47 (22.5%) 16 (7.7%) 7 (3.4%) 1 (0.5%)
<b>Accommodation</b>	
<ul style="list-style-type: none"> <li>Dorms</li> <li>With Family</li> <li>Other</li> </ul>	67 (32.1%) 133 (63.6%) 9 (4.3%)
<b>Tuition fees</b>	
<ul style="list-style-type: none"> <li>Self-Sponsor</li> <li>Grant</li> <li>Missing Values</li> </ul>	155 (74.2%) 52 (24.9%) 2 (1%)

Similar % (50%) of both groups of students stated that they shared some elective courses, while the majority (P 88% and MD 70%) did not do any joint research with each other. The majority of both groups (92% of P and MD) knew that the prescription is a legal document; however, more P than MD knew what is meant by poly pharmacy. Pharmacists (70%) believed that they have more drug expertise than MD practitioners, and are (72%) competent to provide unbiased,

evidence-based information related to drugs and pharmaceutical products to other health care professionals, will not publicly criticize (74%) the ability or performance of other health care professionals, will consult the physician/dentist before making any change in a prescription (75%), and they trust the MD decisions (50%). On the other hand, MD (65%) participants have confidence in the

**Table 2.** Attitudes and perception of pharmacy and medical and dental participants towards inter-professional collaboration.

Statement	Frequency (%)					
	Pharmacy N= 80			Medicine/ Dentistry N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Research collaboration among Medical, Dental and Pharmacy students is beneficial	58 (72.5%)	17 (21.3%)	5 (6.3%)	98 (76%)	28 (21.7%)	3 (2.3%)
IP relationships between Medical, Dental and Pharmacy students should be included in their professional educational programs	59 (73.8%)	20 (25%)	1 (1.3%)	87 (67.4%)	36 (27.9%)	6 (4.7%)
Physicians/ Dentists are superior to Pharmacists	10 (12.5%)	18 (22.5%)	52 (65%)	31 (24%)	33 (25.6%)	65 (50.4%)
Pharmacists are more experienced in drugs than physicians/ Dentists	72 (90%)	6 (7.5%)	2 (2.5%)	81 (62.8%)	36 (27.9%)	12 (9.3%)
Pharmacists are qualified to assess and respond to patients' drug treatment needs	68 (85%)	9 (11.3%)	3 (3.8%)	55 (42.6%)	53 (41.1%)	21 (16.3%)
The Pharmacist is responsible for counseling patients on their drug treatment	72 (90%)	6 (7.5%)	2 (2.5%)	59 (45.7%)	42 (32.6%)	28 (21.7%)
The pharmacist should only dispense the drugs the doctor prescribes	18 (22.5%)	25 (31.3%)	37 (46.3%)	82 (63.6%)	30 (23.3%)	16 (12.4%)
The pharmacist can help in achieving the best therapeutic outcomes	64 (80%)	12 (15%)	2 (2.5%)	86 (66.7%)	31 (24%)	7 (5.4%)
A prescription by a Physician/Dentist should be filled as it is	23 (28.8%)	36 (45%)	21 (26.3%)	83 (64.3%)	36 (27.9%)	8 (6.2%)

pharmacists and trust his/her opinion, while a majority (85%) believed that cooperation with the pharmacist is beneficial to the patient. More than half (55-75%) of the MD stated that they accept the pharmacist's advice on dosage regimen, polypharmacy, drug interaction, two drugs of the same therapeutic class, and changing their prescribed brand to generic drug. Table 2 shows that almost similar percentages of both P and MD groups agree that research collaboration, IP relationship between them as students and an introductory IP experience are beneficial since they share common goals and objectives and their roles are complementary to each other. In addition, large number of P (52, 65%) and MD (65, 50.4%) disagreed to the statement that physicians and dentists are superior to pharmacists but agreed to the latter being more experienced in drugs than physicians and dentists and can help in achieving the best therapeutic outcomes. Almost similar percentages (67-75%) of both groups believe that IP relationships between Medical, Dental and Pharmacy students should be included in their professional educational programs. With regard to the statements that pharmacists are more experienced in drugs than physicians/ Dentists, pharmacists are qualified to assess and respond to patients' drug treatment needs, pharmacists are responsible for counseling patients on their drug treatment, and pharmacists can help in achieving the best therapeutic outcomes, positive responses of P were higher than those of MD students. As can be seen in Table 3, both groups agreed to all the barriers to IPC but responses of P were slightly higher than MD students. Table 4 shows regulatory barriers to efficient and effective participation of pharmacists in IPC. P agree

responses were significantly higher than those of MD students. Table 5 shows responses of participants to questions on knowledge and competencies of pharmacists, and some barriers to their full participation in IPC. The % responses of both groups were almost similar with a tendency of those of P being higher than those of MD students. The only variable that influenced IP collaboration was ethnicity where significantly more Arab than non-Arab pharmacists believed that barriers to IP collaboration include lack of time, lack of trust in physicians/dentists, poor knowledge of IP collaboration, fear of inability to provide unbiased evidence-based information, and fear of being publicly criticized of poor ability and performance.

**Table 3.** Responses of participants to questions on pharmacist-related barriers to inter-professional collaboration

Barrier	Frequency (%)					
	Pharmacy N= 80			Medicine/ Dentistry N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
The inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice	51 (64.6%)	22 (27.8%)	6 (7.6%)	64 (49.6%)	46 (35.7%)	19 (14.7%)
Physicians/ Dentists are concerned that pharmacist-patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45.3%)	47 (36.7%)	23 (18%)
Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role	55 (68.8%)	20 (25%)	5 (6.3%)	63 (49.6%)	50 (39.4%)	14 (11%)
Inadequate education and clinical training about direct patient care in the pharmacy curriculum	53 (66.3%)	18 (22.5%)	9 (11.3%)	73 (56.6%)	36 (27.9%)	20 (15.5%)
Physicians'/ Dentists' fear of being criticized by other members of the healthcare team during collaborative practice	45 (56.3%)	27 (33.8%)	8 (10%)	59 (46.1%)	47 (36.7%)	22 (17.2%)
Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige	39 (48.8%)	33 (41.3%)	8 (10%)	51 (39.8%)	60 (46.9%)	17 (13.3%)
Lack of pharmacists' desire or willingness to change from medication dispensing to direct patient care practice	36 (45%)	36 (45%)	8 (10%)	44 (34.4%)	61 (47.6%)	23 (18%)

**Table 4.** Regulatory barriers that hinder the effective inter-professional collaboration of



Barrier	Frequency (%)					
	Pharmacy, N= 80			Medicine/ Dentistry, N= 129		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
The inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice	51 (64.6%)	22 (27.8%)	6 (7.6%)	64 (49.6%)	46 (35.7%)	19 (14.7%)
Physicians/ Dentists are concerned that pharmacist-patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45.3%)	47 (36.7%)	23 (18%)
Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role	55 (68.8%)	20 (25%)	5 (6.3%)	63 (49.6%)	50 (39.4%)	14 (11%)
Inadequate education and clinical training about direct patient care in the pharmacy curriculum	53 (66.3%)	18 (22.5%)	9 (11.3%)	73 (56.6%)	36 (27.9%)	20 (15.5%)
Physicians/ Dentists' fear of being criticized by other members of the healthcare team during collaborative practice	45 (56.3%)	27 (33.8%)	8 (10%)	59 (46.1%)	47 (36.7%)	22 (17.2%)
Lack of incentives for pharmacists to change their practice, such as increased salaries or more professional prestige	39 (48.8%)	33 (41.3%)	8 (10%)	51 (39.8%)	60 (46.9%)	17 (13.3%)
Lack of pharmacists' desire or willingness to change from medication dispensing to direct patient care practice	36 (45%)	36 (45%)	8 (10%)	44 (34.4%)	61 (47.6%)	23 (18%)

**Table 5.** Responses of participants to questions on knowledge and competencies of pharmacists

Statement	Frequency (%)						Chi-square test P value
	Pharmacy N= 80			Medicine/ Dentistry N= 129			
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	
Pharmacists are more experienced in drugs than physicians/ Dentists	72 (90%)	6 (7.5%)	2 (2.5%)	81 (62.8%)	36 (27.9%)	12 (9.3%)	0.001
Pharmacists are qualified to assess and respond to patient's drug treatment needs	68 (85%)	9 (11.3%)	3 (3.8%)	55 (42.6%)	53 (41.1%)	21 (16.3%)	> 0.001
The Pharmacist is responsible for counseling patients on their drug treatment.	72 (90%)	6 (7.5%)	2 (2.5%)	59 (45.7%)	42 (32.6%)	28 (21.7%)	> 0.001
The pharmacist should only dispense the drugs the doctor prescribes.	18 (22.5%)	25 (31.3%)	37 (46.3%)	82 (63.6%)	30 (23.3%)	16 (12.4%)	> 0.001
The pharmacist can help in achieving the best therapeutic outcomes.	64 (80%)	12 (15%)	2 (2.5%)	86 (66.7%)	31 (24%)	7 (5.4%)	0.03

<b>A prescription by a Physician/Dentist should be filled as it is.</b>	23 (28.8%)	36 (45%)	21 (26.3%)	83 (64.3%)	36 (27.9%)	8 (6.2%)	> 0.01
<b>Pharmacists can screen, monitor, and advice for self-treatment with over-the-counter (OTC) products sold without a prescription.</b>	65 (81.3%)	12 (15%)	3 (3.8%)	64 (49.6%)	36 (27.9%)	27 (20.9%)	> 0.01
<b>Lack of trust and confidence in the competency of each other.</b>	56 (70%)	18 (14%)	6 (4.6%)	60 (46.5%)	42 (32.6%)	27 (20.9%)	0.005
<b>Lack of pharmacists' access to the patient's medical record and the medical history, laboratory data, and other information.</b>	53 (66.3%)	18 (22.5%)	9 (11.3%)	63 (48.8%)	41 (31.8%)	25 (19.4%)	0.04
<b>Lack of physicians' trust in pharmacists' clinical abilities and their ability to provide direct patient care.</b>	57 (71.3%)	16 (20%)	7 (8.8%)	67 (51.9%)	37 (28.7%)	25 (19.4%)	0.03
<b>Inability of pharmacists to document patient care recommendations in the medical record due to laws prohibiting this practice.</b>	51 (63.8%)	22 (27.5%)	6 (7.5%)	64 (49.6%)	46 (35.7%)	19 (14.7%)	0.03
<b>Physicians'/ Dentists concern that pharmacist- patient care recommendations will conflict with their care plan for patients, causing patient harm or poor patient outcomes.</b>	47 (58.8%)	27 (33.8%)	6 (7.5%)	58 (45%)	47 (36.4%)	23 (17.8%)	0.03
<b>Organizational obstacles such as lack of support from the administration or absence of healthcare policy defining the pharmacist's direct patient care role.</b>	55 (68.8%)	20 (25%)	5 (6.3%)	63 (48.8%)	50 (38.8%)	18 (14%)	0.03
<b>Physicians/Dentists fear being criticized by other members of the healthcare team during collaborative practice.</b>	45 (56.3%)	27 (33.8%)	8 (10%)	59 (45.7%)	47 (36.4%)	22 (17.1%)	0.03

## Discussion

It has been demonstrated that most medical errors and incidents leading to patient's health problems are related to poor collaboration (Wai et al., 2020). According to the World Health Organization (WHO), inter-professional education (IPE) is an experience that "occurs when students from two or more professions learn about, from, and with each other" (WHO, 2010).

The remarkable impact of including pharmacists as healthcare team members in the management of chronic diseases with particular emphasis on hypertension and diabetes has been clearly demonstrated by a large number of studies (Hatah, Braund, Tordoff, Duffull, 2014; Cheema, Sutcliffe, Singer, 2014, Tan, Stewart, Elliott, George, 2014, Santschi et al., 2014; De La Rosa; Pitts; Chen, 2020; Lee, McCutcheon; Fazel; Cooley; Slack, 2021)

Effective healthcare management requires collaboration between various healthcare professionals. In every day practice, that kind of attitude and competence may not always be there (Hatah, Braund, Tordoff, Duffull, 2014), which can be ascribed to multiple personal and workplace barriers. Several studies have been published about the attitude towards IPC that have been beneficial to patients with complex, chronic diseases (Pascucci, et al, 2021; Nurchis, et al., 2022) Interprofessional education (IPE) and interprofessional collaboration (IPC) prepares members of the healthcare team to collaborate for the benefit of the patient.

In the present study, we assessed the knowledge and attitude of final year's pharmacy, medical and dental students towards IPC, and studied the factors that hinder their collaboration in the future. Female participants in our study far exceeded males. This is a usual trend in all medical and health sciences colleges in UAE. In addition, most participants were Arabs having 21-23 years of age. This age range is expected as our inclusion criteria focused on final years (fourth and fifth year) students who are about to graduate. About half of the respondents from the three colleges claimed that they shared common courses. Here, it must be mentioned that participants in our survey were not asked to list the courses they shared. However, when the study plan and time schedule for each college was reviewed, it became clear that the only courses that, some students, may have shared were only elective courses taught by healthcare and non-healthcare faculty. IP learning through undergraduate courses has been frequently reported to influence the knowledge of students and their appreciation of the roles and contribution of each other to the benefit of patients. IPE programs were not part of a mandatory course in the curriculum of UAE universities. It has been shown that in colleges where IPE programs are implemented as an extra-curricular program such factor was considered as one of the obstacles to the IPE (Carlisle, & Taing, 2021).

Inter-professional education has also been defined as learning together to promote collaborative practice. A principal aim of IPE is to foster the environment and to nurture and enhance the personal initiative of each member of the healthcare team to willingly and professionally accept with respect the advice, consultation, and opinion of other members of various health disciplines. This necessitates knowledge and appreciation of the expertise, role, and contribution of the other members of the healthcare team. In this respect, sharing common undergraduate courses and collaboration in research such as that conducted through graduation projects would certainly help in breaking the barriers and building bridges of

mutual collaboration built on knowledge, attitude, trust, and respect.

In general results of the present study demonstrated a reasonable level of knowledge and a positive attitude and perception among participants of the three colleges towards IPE and IPC, and the competencies of each other. However, MD students showed some preservation about pharmacists changing their prescribed brand with a generic. It has been pointed out earlier that among the obstacles to inter-professional learning, attitude remains the main factor (Katoue, et al., 2017). Moreover, some studies demonstrated a tendency of medical students to not favor sharing knowledge with other healthcare students (Horsburgh, Lamdin, Williamson, 2001; Reid, Bruce, Allstaff, McLernon, 2006). It has also been suggested that students admitted with negative attitudes towards inter-professional learning, usually do not perform well in the shared courses and this further enhances their negative attitudes (Coster et al, 2008). More recently a study indicated that barriers such as “afraid to provide the wrong information” and “people only share with those who share with them” are important barriers that hinder the process of knowledge sharing (Feroz et al., 2023). Another study also indicated that different obstacles can delay IPE development [Li JTS, et al., 2022]. Other studies demonstrated that maximizing patient care can be enhanced by pre-registration IPE which prepares healthcare professionals for the efficient working in a multi-disciplinary team (O’Leary, Salmon, Clifford, 2020; Choudhury, Salam, Mathur, Choudhury, 2020). Pharmacists and physicians have many competencies in common that can be the basis for a profitable IPE. Results of the present study indicated that MD students are aware of the pharmacist- related barriers that are associated with healthcare policies, and with the fear of physicians that pharmacist’s recommendations on patient treatment may conflict with their own. Healthcare policies require a courageous enlightened decision by decision makers while IPE and IPC can improve the exposure of each member of the healthcare team to other professions during their training (Tran, Kaila, Salminen, 2018). Training with other professions has also been found to improve sense of usefulness and to have clarity in extend of one’s role in a collaborative team (McGuire, Stewart, Akerson, Gloeckner, 2020). A study evaluating the perception of pharmacy and medical students working collaboratively on a telehealth project, indicated similar findings to our results, where students from both disciplines showed enhanced appreciation of the other (Bautista, et al., 2020).

Our results are in good agreement with results of studies conducted in Iraq (Ahmed, 2018) and Malaysia (Aziz, Teck, Yen, 2011) where medical and pharmacy students illustrated positive attitudes toward inter-professional learning and recognized the advantages of shared learning.

Attitudes of participants of various healthcare disciplines were, in general, positively rated based on their responses. However, some misconceptions persist and can be eliminated through IPE. An interesting example on differences in knowledge and views of students from various healthcare disciplines is represented in the present study by the unfamiliarity of large number medical and dental students with the term polypharmacy. On the other hand, the majority (90%) of pharmacy students knew the term. Again a sizable number of medical and dental students did not agree that the pharmacist is responsible for counseling patients on their drug treatment. Such a misconception must change especially in the light of the global progressive evolution in the role of pharmacist. Another misconception is that about two thirds of medical and dental students agreed to the notion that pharmacists should only dispense drugs prescribed by a physician or dentist. Surprisingly only less than 50% of pharmacy students disagreed to this while about 30% were neutral. This can be attributed to the fact that many other healthcare professionals do not have a clear understanding of the pharmacists’

wide range of competencies. However, since knowledge, skills and professional attitudes of healthcare professionals are mostly complementary and overlapping, it is rather logical to learn together to promote future collaborative practice. This is further enhanced by the fact that patients seeking health care are bound to interact with more than one healthcare professional.

There is also a need to stress in undergraduate courses on professional ethics as our results on whether it is ethically acceptable to associate oneself with the pharmaceutical industry and products, the responses were not encouraging. Knowledge on the responsible and ethical behavior in dealing with pharmaceutical industry should be dealt with through common courses such as, among others, professional ethics, and prescribing and dispensing. Most medical and dental students agreed to the question whether they would consult a pharmacist regarding the best treatment schedule and drug interactions. This implies that medical and dental students have confidence in pharmacists, trust them and appreciate the pharmacist's knowledge and skills (WHO, 2010).

It must be pointed out that even though medical and dental students believed that they are not superior to pharmacists, our results indicate that a sense of superiority still lingers. Yet, when the same question was directed to pharmacy students, the majority (75%) believed they would be more cooperative. However, responses of the medical and dental students were positive when it comes to accept the pharmacist opinion on dosage regimen, drug interactions and prescribing two drugs of the same therapeutic class in the same prescription.

Pharmacy students believed that counseling on drug treatment is not the responsibility of the physician or the dentist. They also feel competent enough to provide other healthcare professionals with unbiased evidence-based information related to drugs and pharmaceutical products. This may reflect confidence in what they have learnt in their courses about evidence-based practice and drug literature. However, an interesting result comes up when pharmacy students were asked if they trust the physician's and dentist's opinion. Half of them (47.3%) answered "yes" yet, the other half (47.3%) were uncertain. Again, trust among members of the healthcare team must be enhanced through daily practice-proved competence and enhanced communication skills.

It must be mentioned here that there are obstacles to inter-professional learning that is based on sharing common mandatory courses. These include different organization of the study plans of various healthcare colleges, course contents and time table of courses to be shared. Moreover, IPC in real practice may be learned better and enhanced through active workshops where medical, dental, pharmacy and possibly students of other health disciplines such as nurses and non-healthcare students play the roles of physicians, dentists, pharmacists, nurses and patients respectively. Various scenarios can be prepared to represent examples that warrant interaction between various healthcare team members. Such scenarios should include scenes representing both positive and negative attitudes and practices of all members. We at present are planning for such an activity and such an educational strategy would be our future research project.

A study conducted among the National University of Singapore students displayed that overall, students had a high readiness for IPE, but when the readiness of medical students was compared to that of pharmacy and dentistry students,

the results indicated that pharmacy and dentistry students have lower readiness (Ahmad et al., 2013). Student's readiness have been the subject of many studies in Indonesia (Tyastuti, Onishi, Ekayanti, Kitamura, 2014), the United Arab Emirates (El-Zubeir, Rizk, Al-Khalil, 2006) and Saudi Arabia (Al-Eisa et al., 2016). Barriers to IPE include, among others, different organization of the study plans of various healthcare colleges, course contents and timetabling of courses to be shared. Moreover, inter-professional collaboration in real practice may be learned better and enhanced through active workshops where medical, dental, pharmacy and possibly students of other disciplines such as nurses and non-healthcare students play the roles of physicians, dentists, pharmacists, nurses and patients respectively. Various scenarios can be prepared to represent examples that warrant interaction between various healthcare team members. Such scenarios should include scenes representing both positive and negative attitudes and practices of all members. We at present are planning for such an activity and such an educational strategy would be our future research project.

Our results are in general agreement with those of the studies in which most healthcare undergraduate students have been reported to have positive perceptions to IP learning (Coster et al., 2008; Cooper, Carlisle, Gibbs, Warkins, 2001; Hind et al., 2003). It is surprising that ethnicity influenced the responses of participants to barriers to IPE. Our results indicated that significantly more Arab than non-Arab pharmacists believed that barriers to IP collaboration include lack of time, lack of trust in physicians/dentists, poor knowledge of IP collaboration, fear of inability to provide unbiased evidence-based information, and fear of being publicly criticized of poor ability and performance. Despite such differences between ethnic groups, both knowledge and attitudes of our students towards IPE and IPC are encouraging and efforts are needed to organize educational activities between authorities in various healthcare disciplines to establish a center for IPE.

## Limitations

A major limitation of this study was that we did not include the nurses even though nurses are important members of the healthcare team. Another limitation is the sample size, which was relatively small due to limitation of prospective students enrollment imposed by the accreditation commission of the Ministry of Higher Education.

## Conclusions

We propose that in future there should be some mandatory courses to be common among the different colleges like: pharmacology, pathophysiology, microbiology, biochemistry. However, schedule times of each college and study plans organization should be considered because in many previous instances, there was an intention to do it but due to the above constraints it was hindered. In the Sharjah medical campus, students may share elective course like: languages, social studies, statistics, physics, Islamic studies, history, etc. In addition, workshops should be designed and implemented for pharmacy, medical, dental and nursing students as sort of practical extracurricular activities or can be projected as a theatrical plays showing positive and negative scenarios of IPE and IPC. A more practical intervention could be through IPE sessions in which students of various health and medical disciplines are distributed in groups with each including students of various disciplines to discuss a scenario that covers the roles of each member of the team and

such sessions must be evaluated at the end of the session where the activity and its various aspects are evaluated by the facilitators of the session and the students.

## Statements and Declarations

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### Conflict of Interest

The authors declare no conflict of interest.

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