

Medical Device-related Counseling Practice and Barriers among Sudanese Pharmacists: A Questionnaire-Based Study

Ahmed Ibrahim Fathelrahman¹

¹Department of Clinical Pharmacy, Taif University, Taif, Saudi Arabia

ABSTRACT

Objective: The aim of the present study was to assess medical devices-related counseling practice and barriers among pharmacists. **Methods:** This was a cross-sectional study conducted using a convenient sample of Sudanese pharmacists. An online-version survey was used to collect data. **Findings:** One hundred and thirty pharmacists responded to the online survey. Most pharmacists in this sample were master or Ph.D. degree holders (62.3% and 12.3%, respectively), having a clinical training experience (70%) and substantial proportion are board-certified (30%). Medical devices reported to be commonly inquired by patients were blood glucose monitors, nebulizers, blood pressure monitors, dry powder inhalers, and insulin pens. Devices most frequently requiring counselling were blood glucose monitors, blood pressure monitors, syringes, thermometers, nebulizers, dry powder inhalers, insulin, and weighing scales. The most frequently supplied devices reported were syringes, blood glucose monitors, insulin pens, blood pressure monitors, thermometers, nebulizers, and dry powder inhalers. Devices least frequently requiring counselling were implanted devices, respirometers, and stethoscopes. The least frequently supplied devices were respirometers, implanted devices, and heart rate monitors. **Conclusion:** Medical devices reported to be commonly inquired by patients were most frequently requiring counseling, and most frequently supplied. Findings reflect the availability of devices in the market and pharmacists' response to the needs of their patients. Pharmacists should maintain adequate knowledge about the proper use of medical devices because this is a common patient inquiry.

KEYWORDS: Barriers to counseling, counseling practices, medical devices, medical supply, pharmacists, questionnaire, Sudanese population

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INTRODUCTION

Pharmacists are professional expert in medications. Besides compounding and dispensing, they provide accurate unbiased medicine information to the healthcare providers and patients. They counsel patients to resolve actual drug-related problems and prevent others.^[1] Pharmacists are effective counselors on therapeutic issues because of pharmaceutical care experience accumulated worldwide through decades across generations of pharmacists. Evidence shows positive effects of counseling on patients' clinical, humanistic, and economic outcomes.^[2-5] However, some areas related to therapy remained overlooked. Medical

devices are a good example for such underserved areas of practice. The wide availability of medical devices in various settings of practice put pharmacists under a great challenge to keep pace with this fast-developing and ever-evolving field of practice.^[6]

Many devices are used by patients to monitor the status or to achieve the control of a disease. This is like blood glucose monitors and blood pressure monitors. Such devices are sophisticated, affected by the inappropriate

Address for correspondence:

Dr. Ahmed Ibrahim Fathelrahman,
E-mail: afathelrahman@yahoo.com

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operation, storage or maintenance and the interpretation of their readings needs careful considerations.^[7] The public routinely seeks help from pharmacists to explain devices' proper use and to solve problems arising during operation.^[6]

There is an increase in the number of devices that act as medications' carriers starting from asthma treatments devices like metered-dose inhalers, accuhalers, turbuhalers, spacers, and nebulizers and ending with more sophisticated devices like insulin pens that help patients accurately adjust doses of their medications on daily bases.^[8-10]

Some devices are implanted in patients' bodies to make control of a condition or a function such as cardiac pacemakers, implantable cardiac defibrillators, coronary stents, hip implants, interocular lenses, and implantable insulin pumps. Patients who have implanted devices need specific pharmacotherapeutic care like the use of anticoagulants and other considerations.^[11] Moreover, the use of some devices is associated with high risk of infections.^[12]

All above considerations require that pharmacists counsel patients about medical devices in all settings of practice. It has been reported that community pharmacists consider counseling and dispensing of personal medical devices as a traditional service of community pharmacy.^[6] However, medical device-related counseling practice has not been investigated sufficiently among pharmacists in the literature and to our knowledge this issue has not been assessed in Sudan or Africa. The readiness of Sudanese pharmacists to counsel patients on medical devices has been evaluated elsewhere.^[13] However, the previous study did not evaluate pharmacists' practice. Our hypothesis was that pharmacists counsel patients on the medical devices they know, and they are familiar with. There would be shortages incounseling on sophisticated and uncommon devices. Barriers to counseling identified by previous studies such as lack of knowledge, time, and lack of relevant training may be preventing pharmacists from playing their role in this area effectively.^[14]

The aim of the present study was to evaluate medical device-related counseling practice and barriers among Sudanese pharmacists. Specifically, the study aimed to answer five research questions; (a) what devices represent patients' common inquiry? (b) how frequently pharmacists counsel patients about devices? (c) how frequently they supply devices? (d) how they perceived the need for certain measures related to medical devices? (e) and what are the common barriers to counseling about medical devices?

METHODS

Using a convenience sampling technique, a sample of Sudanese pharmacists participated in a cross-sectional study that was performed from February to June 2020.

Sudanese pharmacists working in different pharmaceutical sectors including community pharmacy, hospital pharmacy, industry (i.e., manufacturing, quality control, and drug promotion), regulatory authority, health insurance sector, and others were eligible to participate in the study. The study included pharmacists who are currently working inside the country or overseas.

The original survey included 11 parts and current analyses covers six, as follows: (a) pharmacists' demography and background information, (b) Medical devices that were reported to be commonly inquired by patients (5-point Likert Scale; never, rarely, sometimes, often, and always), (c) devices that were reported to be most frequently items requiring counselling (5-point Likert Scale; never, rarely, sometimes, often, and always), (d) Devices that were reported to be most frequently items supplied (5-point Likert Scale; never, rarely, sometimes, often, and always), (e) Pharmacists' perceived need for certain measures intended to enhance medical devices-related practice (5-point Likert Scale; strongly disagree, disagree, neutral, agree and strongly agree), and (f) the barriers to counsel patients about medical devices (5-point Likert Scale; strongly disagree, disagree, neutral, agree, and strongly agree).

The list of 20 medical devices covered by the study was decided based on their availability in practice either in the community or hospital settings given that they represent a variety of clinical specialties. The preliminary drafted survey questions and the list of devices were edited and approved by a group of academic staff with excellent experiences in pharmacy practice and healthcare service research.

The survey was prepared as an online format using Google forms. The survey link was sent primarily to pharmacists via Sudanese professional groups in WhatsApp and Facebook. Some key pharmacists from different sectors were asked to distribute the link to other special pharmacy professional groups. Frequent reminders were sent to encourage participation in the survey.

The preliminary plan was to recruit a sample of 400–500 pharmacists to represent the population of Sudanese pharmacists estimated to be at least 5000 (i.e., about 10%) according to the more recent available statistics.^[15]

On the other hand, using the software “PS Power and Sample Size Program,” it was found that a sample size of at least 64 participants per group was enough to detect

a significant difference between two groups (i.e., total 128) using Student's *t*-test with a power of 0.8, α (i.e., significance level) = 0.05, σ (sigma: Within-group standard deviation) = 0.6, and δ (delta: A difference in population mean) = 0.3.

An ethical approval of the study protocol was obtained from the Taif university research ethics committee (reference number 41-00193). Pharmacists were notified that participation is voluntary. Also, they were told that data will be analyzed and presented anonymously, and that nothing can be used to reveal their identity. All agreed to participate in the survey.

Data were analyzed and presented descriptively and comparatively using IBM SPSS statistics for windows, version 22.0, Armonk, NY, USA. IBM Corp. The original questions were treated and analyzed firstly as qualitative variables and presented as frequencies and percentages showing how pharmacists responded to the questions. Average scores on how frequently medical devices represent patients' inquiry, counseling, and supply have been computed out of 5-point Likert Scale (i.e., never = 1, rarely = 2, sometimes = 3, often = 4, and always = 5). Such derived variables were treated as quantitative variables. Cronbach's alpha was used to assess the internal consistency/reliability (i.e., how closely related a set of items are as a group) of the items constituting one construct with total computed scores; namely "how frequently medical devices represent patients' common inquiry, to what extent do pharmacists normally counsel their patients about devices, and to what extent do pharmacists normally supply devices to their patients with or without counseling? A Cronbach's alpha of 0.8 <math>< 0.9</math> represents good reliability and that of ≥ 0.9 represents excellent reliability. Comparisons between groups were conducted using Student's *t*-test concerning the variables gender, residence (overseas versus inside Sudan), board certification, and clinical training. One-way ANOVA was used to test for differences between groups concerning the variables age group, sector, years of experience, work location (rural, suburban, and urban), and highest qualifications. A $P < 0.05$ was considered statistically significant.

RESULTS

Hundred and thirty pharmacists responded to the online survey. The highest number of pharmacists were from the age group 35–44 years (33.1%), followed by age group "25–34 years (28.5%), then age group 45–54 years (26.2%), age group ≥ 55 years (10.8%) and age <25 years (1.5%). Males (53.8%) were slightly more than females. Bachelor's, Master's, Doctor of

Pharmacy (PharmD), and Doctor of Philosophy (PhD) holders represented 23.1%, 62.3%, 2.3%, and 12.3% of participants, respectively. Respondents located inside Sudan represented about two-thirds (65.4%) and the rest (34.6%) were overseas. Most of the latter group were residents of Gulf countries (25.4% of all respondents and 73.3% of overseas). By sector, most of the respondents were from academia (30.8%) followed by community pharmacy (25.4%), hospital pharmacy (14.6), regulatory affairs (10.8%), insurance sector (5.4%), drug marketing and promotion (5.4%), pharmaceutical manufacturing (production and Q.C., 3.8%), research institution (2.3%) and nongovernmental organization (1.5%). For comparative analyses, the two sectors "academia" and "research institutions" were added together in one group and the two sectors "marketing and promotion" and "pharmaceutical manufacturing" were added together in one group entitled "pharmaceutical industry". Most of the respondents received clinical training (70%) and about one-third got a board certification (30%).

Cronbach's alpha showed high reliability of the 20 questions on the devices inquired by patients (Cronbach's alpha = 0.912). Five devices reported to be commonly inquired by patients start with blood glucose monitors, followed by nebulizers, blood pressure monitors, dry powder inhalers, and insulin pens [Table 1]. Implanted devices, stethoscopes, respirometers, and meters were reported to be the least commonly inquired by patients.

Cronbach's alpha showed high reliability of the 20 questions on the devices most frequently requiring counseling (Cronbach's alpha = 0.937). Devices most frequently requiring counseling reported by pharmacists included blood glucose monitors, followed by blood pressure monitors, syringes, thermometers, nebulizers, dry powder inhalers, insulin pens, and weighing scales [Table 2]. Devices least frequently requiring counseling reported by pharmacists included implanted devices, respirometers, and stethoscopes.

Cronbach's alpha showed high reliability of the 20 questions on the most frequently supplied devices (Cronbach's alpha = 0.938). Syringes came first as the most frequently supplied device, followed by blood glucose monitors, insulin pens, blood pressure monitors, thermometers, dry powder inhalers, and nebulizers [Table 3]. Devices that were reported to be the least frequently supplied items included respirometers, implanted devices, and heart rate monitors.

Special training provided to pharmacy students and for practicing pharmacists as a part of Continuing Professional Development (CPD) program were two

Table 1: Medical devices reported to be commonly inquired by patients

Question	Responses frequencies (%)				
	Never	Rarely	Sometimes	Often	Always
Among the following, which medical devices represent patients' common inquiry?					
Puffers	23 (17.7)	32 (24.6)	31 (23.8)	21 (16.2)	23 (17.7)
Spacers	10 (7.7)	19 (14.6)	46 (35.4)	26 (20)	29 (22.3)
Dry powder inhalers	3 (2.3)	7 (5.4)	29 (22.3)	41 (31.5)	50 (38.5)
Nebulizers	0	8 (6.2)	23 (17.7)	43 (33.1)	56 (43.1)
Accuhalers	17 (13.1)	14 (10.8)	45 (34.6)	27 (20.8)	27 (20.8)
Turbuhalers	15 (11.5)	9 (6.9)	40 (30.8)	29 (22.3)	37 (28.5)
Blood pressure monitors	2 (1.5)	6 (4.6)	31 (23.8)	39 (30)	52 (40)
Heart rate monitors	27 (20.8)	29 (22.3)	30 (23.1)	19 (14.6)	25 (19.2)
Blood glucose monitors	1 (0.8)	2 (1.5)	25 (19.2)	31 (23.8)	71 (54.6)
Insulin pens	4 (3.1)	17 (13.1)	34 (26.2)	24 (18.5)	51 (39.2)
Pens other than insulin	24 (18.5)	28 (21.5)	35 (26.9)	16 (12.3)	27 (20.8)
Implanted devices	38 (29.2)	38 (29.2)	28 (21.5)	12 (9.2)	14 (10.8)
Weighing scales	16 (12.3)	21 (16.2)	33 (25.4)	29 (22.3)	31 (23.8)
Syringes	14 (10.8)	16 (12.3)	36 (27.7)	26 (20)	38 (29.2)
Stethoscope	43 (33.1)	35 (26.9)	28 (21.5)	11 (8.5)	13 (10)
Thermometers	10 (7.7)	37 (28.5)	33 (25.4)	18 (13.8)	32 (24.6)
Testing kits	26 (20)	18 (13.8)	51 (39.2)	11 (8.5)	24 (18.5)
First aid equipment	14 (10.8)	28 (21.5)	39 (30)	20 (15.4)	29 (22.3)
Meters	27 (20.8)	33 (25.4)	38 (29.2)	16 (12.3)	16 (12.3)
Respirometers	45 (34.6)	34 (26.2)	24 (18.5)	14 (10.8)	13 (10)

Table 2: Devices most frequently requiring counseling reported by our sample of pharmacists

Question	Responses frequencies (%)				
	Never	Rarely	Sometimes	Often	Always
To what extent do you normally counsel your patients about the following devices?					
Puffers	42 (32.3)	32 (24.6)	24 (18.5)	15 (11.5)	17 (13.1)
Spacers	22 (16.9)	31 (23.8)	26 (20)	28 (21.5)	23 (17.7)
Dry powder inhalers	13 (10)	18 (13.8)	31 (23.8)	33 (25.4)	35 (26.9)
Nebulizers	13 (10)	20 (15.4)	28 (21.5)	34 (26.2)	35 (26.9)
Accuhalers	32 (24.6)	31 (23.8)	20 (15.4)	28 (21.5)	19 (14.6)
Turbuhalers	27 (20.8)	26 (20)	21 (16.2)	30 (23.1)	26 (20)
Blood pressure monitors	10 (7.7)	12 (9.2)	34 (26.2)	30 (23.1)	44 (33.8)
Heart rate monitors	40 (30.8)	21 (16.2)	29 (22.3)	22 (16.9)	18 (13.8)
Blood glucose monitors	8 (6.2)	10 (7.7)	28 (21.5)	29 (22.3)	55 (42.3)
Insulin pens	16 (12.3)	24 (18.5)	32 (24.6)	25 (19.2)	33 (25.4)
Pens other than insulin	45 (34.6)	27 (20.8)	19 (14.6)	17 (13.1)	22 (16.9)
Implanted devices	59 (45.4)	29 (22.3)	25 (19.2)	13 (10)	4 (3.1)
Weighing scales	14 (10.8)	26 (20)	37 (28.5)	24 (18.5)	29 (22.3)
Syringes	18 (13.8)	23 (17.7)	25 (19.2)	24 (18.5)	40 (30.8)
Stethoscope	53 (40.8)	31 (23.8)	20 (15.4)	17 (13.1)	9 (6.9)
Thermometers	18 (13.8)	23 (17.7)	25 (19.2)	26 (20)	38 (29.2)
Testing kits	31 (23.8)	29 (22.3)	31 (23.8)	21 (16.2)	18 (13.8)
First aid equipment	22 (16.9)	31 (23.8)	33 (25.4)	27 (20.8)	17 (13.1)
Meters	29 (22.3)	30 (23.1)	32 (24.6)	17 (13.1)	22 (16.9)
Respirometers	56 (43.1)	32 (24.6)	27 (20.8)	8 (6.2)	7 (5.4)

measures got the agreement of the highest proportion of respondents [83.1% each, Table 4]. The other measures (a didactic course for pharmacy students and a reference book) still got the acceptance of most respondents (81.6% and 73.1%, respectively).

Barriers got the greatest agreement of respondents [Table 5] were "workload in pharmacy" (37%), "non-supportive policies" (33.9%), "lack of knowledge" (33.8%), and "time" (32.3%). Substantial proportion of respondents (72.3%) did not

Table 3: Most frequently supplied devices reported by our sample of pharmacists

Question	Responses frequencies (%)				
	Never	Rarely	Sometimes	Often	Always
To what extent do you normally supply the following devices to your patients with or without counseling?					
Puffers	57 (43.8)	25 (19.2)	23 (17.7)	9 (6.9)	16 (12.3)
Spacers	41 (31.5)	25 (19.2)	36 (27.7)	15 (11.5)	13 (10)
Dry powder inhalers	33 (25.4)	18 (13.8)	30 (23.1)	25 (19.2)	24 (18.5)
Nebulizers	29 (22.3)	27 (20.8)	30 (23.1)	20 (15.4)	24 (18.5)
Accuhalers	43 (33.1)	26 (20)	28 (21.5)	14 (10.8)	19 (14.6)
Turbuhalers	44 (33.8)	29 (22.3)	18 (13.8)	17 (13.1)	22 (16.9)
Blood pressure monitors	29 (22.3)	21 (16.2)	39 (30)	15 (11.5)	26 (20)
Heart rate monitors	43 (33.1)	32 (24.6)	26 (20)	19 (14.6)	10 (7.7)
Blood glucose monitors	29 (22.3)	18 (13.8)	29 (22.3)	21 (16.2)	33 (25.4)
Insulin pens	30 (23.1)	23 (17.7)	33 (25.4)	16 (12.3)	28 (21.5)
Pens other than insulin	44 (33.8)	28 (21.5)	28 (21.5)	12 (9.2)	18 (13.8)
Implanted devices	63 (48.5)	24 (18.5)	22 (16.9)	9 (6.9)	12 (9.2)
Weighing scales	33 (25.4)	29 (22.3)	35 (26.9)	13 (10)	20 (15.4)
Syringes	24 (18.5)	19 (14.6)	24 (18.5)	14 (10.8)	49 (37.7)
Stethoscope	47 (36.2)	28 (21.5)	27 (20.8)	13 (10)	15 (11.5)
Thermometers	29 (22.3)	26 (20)	29 (22.3)	19 (14.6)	27 (20.8)
Testing kits	37 (28.5)	29 (22.3)	32 (24.6)	13 (10)	19 (14.6)
First aid equipment	33 (25.4)	28 (21.5)	34 (26.2)	18 (13.8)	17 (13.1)
Meters	38 (29.2)	28 (21.5)	36 (27.7)	13 (10)	15 (11.5)
Respirometers	60 (46.2)	30 (23.1)	18 (13.8)	14 (10.8)	8 (6.2)

Table 4: Pharmacists' perceived need for certain measures intended to enhance devices-related practices

Question	Responses frequencies (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
To what extent do you agree or disagree about the need for the following?					
Pharmacy colleges should offer pharmacy students a didactic course on medical devices	10 (7.7)	1 (0.8)	13 (10)	37 (28.5)	69 (53.1)
Pharmacy colleges should offer pharmacy students special practical training on medical devices	11 (8.5)	0	11 (8.5)	40 (30.8)	68 (52.3)
There should be special training on medical devices provided to practicing pharmacists as a continuing professional development	9 (6.9)	2 (1.5)	11 (8.5)	43 (33.1)	65 (50)
There is a need for a reference book on medical devices for pharmacists	12 (9.2)	5 (3.8)	18 (13.8)	36 (27.7)	59 (45.4)

agree that “customers/patients do not trust pharmacists” is a barrier.

There were no significant differences (in average scores) by gender, clinical training, sector, age group, years of experience, work location, and highest qualifications in the average scores rating devices being commonly inquired by patients, devices requiring counseling, and the devices being supplied to patients. However, overseas pharmacists reported significantly more counseling activity on medical devices compared to those residents in Sudan [Table 6]. Board-certified pharmacists reported significantly more counseling activity on medical devices and received significantly more inquiries from patients.

DISCUSSION

The present study revealed a set of findings that help

understanding pharmacists' practice regarding medical devices. Findings will assist in improving pharmacists' practice via designing training and educational needs of both pharmacists and pharmacy students and setting supportive policies and regulations. Blood pressure monitors and blood glucose monitors in addition to others were among the top five medical devices reported to be commonly inquired by patients, most frequently requiring counseling, and most frequently supplied. The two devices were commonly available in community pharmacy practice. Thus, findings reflect the availability of devices in the market and the pharmacists' effective response to the needs of their patients. Barriers to medical device-related counseling practice included workload in pharmacy, nonsupportive policies, lack of knowledge, and time. This supports the finding shown by Rasheed

Table 5: Barriers to counsel patients about medical devices

Question	Responses frequencies (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
What are the barriers to counsel patients about medical devices?					
Lack of knowledge	10 (7.7)	18 (13.8)	58 (44.6)	31 (23.8)	13 (10)
Lack of competence and skills	21 (16.2)	28 (21.5)	50 (38.5)	23 (17.7)	8 (6.2)
Lack of confidence	40 (30.8)	31 (23.8)	32 (24.6)	21 (16.2)	6 (4.6)
Shortage in number of pharmacists	37 (28.5)	20 (15.4)	42 (32.3)	20 (15.4)	11 (8.5)
Workload in pharmacy	20 (15.4)	17 (13.1)	45 (34.6)	34 (26.2)	14 (10.8)
Time	25 (19.2)	21 (16.2)	42 (32.3)	29 (22.3)	13 (10)
Customers/patients will not be interested	27 (20.8)	24 (18.5)	54 (41.5)	18 (13.8)	7 (5.4)
Customers/patients do not trust pharmacists	54 (41.5)	40 (30.8)	27 (20.8)	9 (6.9)	0
Nonsupportive policies	28 (21.5)	24 (18.5)	34 (26.2)	27 (20.8)	17 (13.1)
Employers will not allow	65 (50)	28 (21.5)	24 (18.5)	12 (9.2)	1 (0.8)
No financial gain/no one would like to pay for the service	73 (56.2)	9 (6.9)	21 (16.2)	12 (9.2)	15 (11.5)

Table 6: Differences by residence and board certification regarding how frequently medical devices represent patients' inquiry, counseling, and supply

Items	Score out of 5, mean (SD)	P
How frequently medical devices represent patients' common inquiry?		
Residence		
Inside Sudan	3.16 (0.72)	0.074
Overseas	3.4 (0.79)	
Board certification		
Yes	3.5 (0.77)	0.012
No	3.1 (0.73)	
To what extent do pharmacists normally counsel their patients about medical devices?		
Residence		
Inside Sudan	2.8 (0.82)	0.013
Overseas	3.2 (0.99)	
Board certification		
Yes	3.2 (0.93)	0.042
No	2.8 (0.87)	
To what extent do pharmacists normally supply medical devices to their patients with or without counseling?		
Residence		
Inside Sudan	2.6 (0.85)	0.534
Overseas	2.7 (1.10)	
Board certification		
Yes	2.8 (0.98)	0.170
No	2.6 (0.92)	

SD=Standard deviation

et al. who have reviewed the literature on the community pharmacists' counseling practice in Saudi Arabia.^[14]

In terms of qualification, most pharmacists in this sample were master's or Ph.D. degree holders, having clinical training experience, and substantial proportion of them are board-certified. Clinical training includes hospital training that involves direct interaction with patients taken as part of a master's, postgraduate diploma, CPD, or training attachment because most of the pharmacists in the country were bachelor's degree (BSc) holders without formal clinical training during the study. Board

certification includes for example certification of the American Board of Clinical Pharmacotherapy and the American Board of Clinical Nutrition Support Pharmacy which are taken via examination only and do not include actual practical training.

In most situations, medical devices reported to be commonly inquired by patients were most frequently requiring counseling, and most frequently supplied despite the presence of some variability in ranking. According to rank, devices reported to be commonly inquired by patients were blood glucose monitors, nebulizers, blood pressure monitors, dry powder inhalers,

and insulin pens. Devices most frequently requiring counselling were blood glucose monitors, blood pressure monitors, syringes, thermometers, nebulizers, dry powder inhalers, insulin pens, and weighing scales. Devices most frequently supplied were syringes, blood glucose monitors, insulin pens, blood pressure monitors, thermometers, dry powder inhalers, and nebulizers.

Devices like syringes are used by families in Sudan and other countries to measure oral liquid medications. Evidence shows a need for a demonstration of the correct way to use such devices for that purpose.^[16] The demonstration is important and effective educational technique that should be incorporated in counseling to teach patients on proper devices' use. Research on inhaler devices revealed that the provision of active device technique education improves device technique in older adults.^[17] In addition, a simple feasible intervention incorporating daily reminders via inhaler technique labels leads to an improvement in inhaler technique and asthma outcomes.^[18] In Jordan, the pharmacist-led educational intervention resulted in improved inhaler technique scores.^[19] Using only actual demonstration with inhaler device counseling showed superior improvement in performance.^[20]

The benefits that can be gained by patients and customers from proper counseling on medical devices are diverse. Patients' convenience and satisfaction with their devices affect their adherence to the pharmacological treatment which in turn affects their health outcomes and costs.^[21] Arora *et al.* concluded that "proper education to patients on correct usage may not only improve control of the symptoms of the disease but might also allow dose reduction in long time."^[22]

In our study, overseas pharmacists reported better medical device-related counseling practice. Most overseas pharmacists in this sample were residents of Gulf countries. The presence of policies supportive of medical devices industry and encouraging pharmacists to serve patients and customers with their device-related needs might explain such findings. According to Howard, Gulf Cooperation Council countries including Saudi Arabia, the United Arab Emirates, and Qatar represent fertile ground for the development of medical technologies and have favorable conditions for the medical device market.^[23] Svarstad reported that counseling practices varied significantly according to the intensity of a state's counseling regulation.^[24] This implies that counseling practice may differ widely by country according to the available policies. Another explanation of the previously stated finding would be the availability of such devices in the market and pharmacists' regular exposure to them.

On the other hand, the nature of different sectors and practice settings would be expected to play a role in the pharmacists' variability of practice. Schommer and Wiederholt found that pharmacists in different practice settings and positions reported different counseling-related barriers and facilitators.^[25] Evidence shown that the success of educational inhaler technique interventions differed by practice setting where outpatient clinics performed best.^[26] However, in contrast to the former evidence, there were no significant differences between our pharmacists by sector concerning medical devices reported to be commonly inquired by patients, devices most frequently requiring counseling, and devices most frequently supplied.

A limitation of the present study was the small sample size. In addition, a limitation that is inherent in surveys in general which is applicable to this study is the recall bias. The setting of the study was another limitation which limits the generalizability of findings. Thus, there is a need to replicate the study in a larger sample of community pharmacists to support the preliminary findings of this study. To our knowledge, this is the first study evaluating medical device-related counseling practice and barriers among pharmacists in Sudan and Africa.

The study revealed a variable but acceptable counseling practice across a variety of devices. Medical devices reported to be commonly inquired by patients were most frequently requiring counseling, and most frequently supplied. Findings reflect the availability of devices in the market and pharmacists' response to the needs of their patients. Findings suggest pharmacists should maintain adequate knowledge about the proper use of medical devices because this is a common patient inquiry.

AUTHORS' CONTRIBUTION

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