Fitzpatrick RM, Witry MJ, Doucette WR, Kent K, Deninger MJ, McDonough RP, Veach S. Retrospective analysis of drug therapy problems identified with a telephonic appointment-based model of medication synchronization. Pharmacy Practice 2019 Apr-Jun;17(2):1373.

https://doi.org/10.18549/PharmPract.2019.2.1373

Original Research

Retrospective analysis of drug therapy problems identified with a telephonic appointment-based model of medication synchronization

Rebecca M. FITZPATRICK, Matthew J. WITRY, William R. DOUCETTE, Kelly KENT, Michael J. DENINGER, Randy P. MCDONOUGH, Stevie VEACH.

Received (first version): 15-Sep-2018 Accepted: 8-Apr-2019 Published online: 30-May-2019

Abstract

Objectives: To describe the drug therapy problems (DTPs) identified for patients enrolled in an Appointment Based Model (ABM) for medication synchronization, describe the pharmacist-delivered clinical interventions, and assess what patient characteristics are associated with the number of DTPs identified.

Methods: A cross-sectional chart review of 1 month of pharmacist notes for telephone ABM encounters at one independent community pharmacy in the Midwest U.S. was performed for a systematic random sample of patients active in the program during September 2017. Included patients were 18 years and older and took one or more synchronized medications. Data included months in the program, gender, age, insurance type, refill interval, medications (synchronized and total), DTP category, and intervention category. Descriptive statistics were calculated, and a multiple linear regression tested the association between patient characteristics and the number of DTPs identified.

Results: The study involved 209 subjects, 54% women, with a mean age of 69.5 years and. The average number of medications synchronized was 4.7, the mean total number of medications was 6.3, and mean length of time in the program was 20 months. The DTPs (n=334) identified included needs additional drug therapy (43.1%), inappropriate adherence (31.4%), unnecessary drug therapy (15.0%), and adverse drug reaction (9.6%). The regression showed age and number of medications was positively associated with number of DTPs identified, but months enrolled was not.

Conclusions: This ABM approach identified several hundred DTPs with corresponding interventions within a one-month period, suggesting that ABMs have a significant potential to improve patient care. The data also suggest that pharmacist interventions within an ABM program are valuable beyond the first few fills as patients move into maintenance use of their medications, especially for patients of advancing age and polypharmacy.

Keywords

Medication Adherence; Medication Therapy Management; Drug-Related Side Effects and Adverse Reactions; Professional Practice; Pharmacies; Community Pharmacy Services; Pharmacists; United States

INTRODUCTION

Polypharmacy (taking 4 or more medications) and the complexity of medication regimens can lead to adverse drug events and medication nonadherence.[1,2] Such drug therapy problems (DTPs) are associated with significant avoidable health care utilization, morbidity, and mortality.[3-7] The identification of DTPs, including nonadherence, is a common process measure used for describing pharmacist interventions as a surrogate for primary outcomes that occur later in life.[8-11]

Nonadherence is a complex phenomenon and there are many reasons why patients do not take their medications as directed.[12] A report by the National Community Pharmacy Association (NCPA) estimated that 28% of patients fail to refill medications on time and of those, 34% listed their nonadherence reason as they "ran out".[13] To address patient issues of medication management and refill coordination, a set of services have been developed under the terms "Medication Synchronization" and the "Appointment Based Model" for refills.[14] Medication synchronization is the process of aligning a patient's refills to reduce the number of trips to the pharmacy. The appointment based model infers that the patient and pharmacist are having a clinically-focused discussion about the synchronized medications.[14]

Initial claims-based analyses suggest these programs decrease the number of days patients go without their various medications through the aligning of their refills.[15,16] Patients that have their medications synchronized have been found to have higher levels of adherence, although evidence is lacking about the effect on clinical outcomes.[17-22] ABM and medication synchronization also have

Rebecca M. FITZPATRICK. PharmD. Hartig Drug, Dubuque, IA (United States). [At time of study, was PGY1 Community Pharmacy Resident at The College of Pharmacy, University of Iowa, Iowa City, IA]. rebeccamanderson@outlook.com
Matthew J. WITRY. PharmD, PhD. Assistant Professor. Department of Pharmacy Practice and Science, College of Pharmacy, University of Iowa. Iowa City, IA (United States). matthew-witry@uiowa.edu
William R. DOUCETTE. PhD. Division Head and Veale Professor in Healthcare Policy, Department of Pharmacy Practice and Science, College of Pharmacy, University of Iowa. Iowa City, IA (United States). william-doucette@uiowa.edu
Kelly KENT, PharmD, BCPS. Director of Clinical Services. Towncrest Pharmacy. Iowa City, IA (United States). keljokent@yahoo.com
Michael J. DENINGER. PhD, RPh. Co-owner. Towncrest Pharmacy. Iowa City, IA (United States). deninger@towncrest.com
Randy P. MCDONOUGH. PharmD, MS, BCPS, BCGP. Co-owner. Towncrest Pharmacy. Iowa City, IA (United States). mcdonough@towncrest.com
Stevie VEACH. PharmD, BCACP. Clinical Assistant Professor. Department of Pharmacy Practice and Science, College of Pharmacy, University of Iowa. Iowa City, IA (United States). stevie-veach@uiowa.edu

purported benefits to the pharmacy related to workflow, inventory management, the increased revenues associated with additional fills, and payer incentives for improved adherence for certain medication classes.[14,23-25] While the effect of ABM programs on adherence has been studied, less is known about the DTPs that can be identified by pharmacists as part of the process.

Implementing ABM programs can be complicated and involving patients in high quality interactions requires deliberate effort.[26,27] Pharmacies may struggle to identify drug therapy problems for refill prescriptions as part of an ABM program if they are not already proactively assessing patients for DTPs on a continuous basis.[28] Delegating dispensing tasks to technicians, integrated electronic documentation, and continuous approaches to medication monitoring are emerging approaches that may facilitate ABMs for medication synchronization.[29,30] The present study describes such an approach using a telephonically delivered ABM intervention supported by the pharmacy's overall workflow designed to continually monitor medications and electronically document interventions.

The objectives of the study were: To describe the drug therapy problems (DTPs) identified for patients enrolled in an Appointment Based Model (ABM) for medication synchronization and described the pharmacist-delivered clinical interventions. Also, to test if the duration of patient enrollment in a medication synchronization program impacts the number of DTPs identified.

METHODS

Study Design

This study used a retrospective chart review of one month of the pharmacist notes documented in the pharmacy's electronic documentation system as part of the pharmacy ABM for medication synchronization. The study pharmacy uses an electronic documentation system to maintain a record of pharmacist notes, prescriber communications, and other information about each patient. This includes encounters related to dispensing, appointment based medication synchronization, medication therapy management, and other notes. Such documentation facilitates the continuous medication monitoring approach to patient care.[30] A clinical pharmacist had made the ABM assessments and interventions and a separate community pharmacy resident performed the abstraction. The pharmacy is located in the Midwest U.S. The study was granted an exempt status by the University IRB.

ABM procedures

Patients were enrolled into the medication synchronization program by recommendation from the pharmacist or another staff member. Interested patients discuss the process with the pharmacist and sign up for the service. The pharmacist performed a medication reconciliation to ensure active medications are synchronized. The pharmacist identified a synchronization date and partial fills were used to align medication quantities.

For refills following the initial enrollment into the program, a telephone call was placed by a clinical pharmacist five days before the synchronization date to identify changes in therapy, adherence concerns, and adverse drug reactions. In this review, the pharmacist may identify DTPs related to both synchronized and non-synchronized medications. The clinical pharmacists were residency trained and perform other services such as medication reviews and disease state education. The pharmacy filled the patient's medications so they would be ready for pickup. This spacing allowed for time to contact prescribers for refill requests, order expensive medications, and ensure the needed quantity was on hand. The patient was then called again on the synchronization date by a pharmacy student, technician, or pharmacist to be notified the prescriptions were ready to be picked up. When picking up the prescriptions, the patient and pharmacist have another opportunity to discuss changes and concerns from the initial call or they could discuss new issues.

Pharmacist identification of DTPs and interventions

The residency trained pharmacist identified DTPs and made clinical interventions as part of the ABM program. Medication adherence was typically assessed using a multifactorial assessment and addressed using counseling, packaging, or requesting 90-day prescriptions.[31] Needs Additional Drug Therapy often related to annual influenza vaccines. The statewide immunization registry was checked to identify if patients were due for other vaccinations. Medication Therapy Management was documented if a therapy need was identified (e.g. statin in diabetes). In such case, a note was faxed to the prescriber requesting to initiate a new medication. The clinical software also alerted high risk drug for patients over 65.[32] In this case, the patient's situation is reviewed and if appropriate following a discussion with the patient, a recommendation would be faxed to the prescriber. PDMP Evaluations were generally documented for new patients to the pharmacy or requests to pay cash. Other interventions were made and documented as appropriate.

Patient selection

A systematic random sampling approach was used to identify patients for the sample. Patients were selected if their synchronization date fell on an odd date in September 2017. The odd dates were based on the result of a coin flip (odd versus even numbered day of the month). A sample was used to increase the feasibility of completing the analysis given the time available and was not expected to influence the interpretability of the results. Subjects also had to be ≥18 years-old and taking at least two synchronized medications.

Variables abstracted

An electronic form was utilized to collect data about drug therapy problems from both the pharmacy's dispensing and clinical software. Information collected from the dispensing software included synchronization date, enrollment date, gender, age, insurance, refill frequency (30-90 days), number of medications synchronized, number of total active medications, and medication classes. Refill history was extracted from the dispensing software retrospectively covering a 90-day period, from August 1 - October 31, 2017, to find the total number of unique

https://doi.org/10.18549/PharmPract.2019.2.1373

Table 1. Description of Study Sample (N=209)

Characteristic	N (%) or Range	Mean (SD)
Age (years)	29-97	69.5 (13.0)
Gender		
Male	96 (45.9)	
Female	113 (54.1)	
Insurance		
No Insurance	2 (1.0)	
Medicaid	9 (4.3)	
Medicare Part D	102 (48.8)	
Private	96 (45.9)	
Duration Enrolled (months)	0-30	20.3 (8.9)
Sync Interval (days)		
30	160 (76.6)	
60	4 (1.9)	
90	45 (21.5)	
Number of synchronized meds	1-14	4.7 (2.7)
Number of total unique meds	1-20	6.3 (3.7)
Number of DTPs identified	0—12	1.60 (1.76)
Numbers may not sum to total due to missing data		

medications. Synchronized medications were classified according to AHFS classification (E.g. vaccines, cardiovascular, central nervous system). DTP categories and pharmacist interventions were collected from the pharmacy's clinical software dated September 1 through September 30, 2017. DTPs were classified based on the pharmacy's clinical dispensing software (PharmClin, Integrated Pharmacy Solutions, Iowa City, IA, USA) categories. Demographic information for age, gender, insurance type, and synchronized medications was collected for those patients who were included in the sample.

Statistical analysis

Descriptive statistics were used to analyze drug therapy problems and pharmacist interventions. A multiple linear regression was used to test the influence of age, male gender, months enrolled in ABM, and number of medications synchronized on the number of DTPs identified during the September ABM encounter with the pharmacist.

Table 2. Medication classes associated with identified DTPs

AHFS Medication Class	Frequency (N = 365)
Vaccines	97
Cardiovascular Drugs	89
Central Nervous System	55
Anti-infective Agents	39
Hormones & Synthetic Substitutes	38
Gastrointestinal Drugs	10
Respiratory Tract Agents	9
Eye, Ear, Nose, & Throat Preparations	9
Skin & Mucous Membranes	8
Blood Formation, Coagulation, and Thrombosis	4
Autonomic Drugs	4
Electrolytic, Caloric, & Water Balance	2
Vitamins	1

RESULTS

There were 209 patients that met inclusion criteria and had their synchronization date on an odd numbered day in September 2017. The average age for the sample was 69.5 years (range 29-97), and 54.1% were female (Table 1). Patients had on average, 4.7 (range 1-14) synchronized medications on their September 2017 synchronization date and 6.3 (range 1-20) unique total medications listed on their dispensing profile. The most common sync interval was 30 days. The most commonly synchronized medication (N=903) by class was cardiovascular medications, such as anti-hypertensives.

Overall, 74.2% of ABM participants had at least one DTP identified during their encounter. In all, 365 medications (Table 2) were associated with 334 DTPs (Table 3). The most common medication classes associated with the DTPs were vaccines=97 and cardiovascular medications=89. The most common DTPs identified were needs additional drug therapy (43.1%), inappropriate adherence (31.4%), unnecessary drug therapy (15.0%), and adverse drug reaction (9.6%). The most common intervention documented was to address medication adherence, followed by recommending a vaccination.

Table 3. DTPs identified and corresponding intervention category

DTP	Associated Intervention	Frequency (%)
Needs Additional Drug Therapy		144 (43.1)
	Annual influenza vaccine indicated/administered	96 (66.7)
	Prescription Counseling	27 (18.8)
	Supplementation Recommended	14 (19.7)
	Medication Therapy Management appointment scheduled and/or completed	7 (4.9)
Inappropriate adherence		105 (31.4)
	Assess and address potential adherence Issue	104 (99.0)
	Medication Therapy Management appointment scheduled and/or completed	1 (1.0)
Unnecessary Drug Therapy		50 (15.0)
	Duplicate Therapy identified/ managed	50 (100)
Potential Adverse Drug Reaction		32 (9.6)
	High Risk Drug for Patient >65yo assessed and managed	26 (81.3)
	Prescription Counseling	1 (3.1)
	Medication Therapy Management appointment scheduled and/or completed	1 (3.1)
	Address Adherence Issue	2 (6.3)
	Drug-Drug Interaction assessed, Managed	1 (3.1)
	Prescription drug monitoring program evaluation	1 (3.1)
Dose Too Low		3 (0.9)
	Medication Therapy Management appointment scheduled and/or completed	2 (66.7)
	Prescription Counseling	1 (33.3)
DTP: Drug Therapy Problem.		

https://doi.org/10.18549/PharmPract.2019.2.1373

Table 4. Influence of patient characteristics on the number of DTPs identified

Variable	B	Std. Error	*P*
(Constant)	-0.675	0.649	0.300
Gender	0.078	0.233	0.739
Age	0.024	0.009	0.009
Months Enrolled	-0.019	0.014	0.185
Total # Active Meds	0.150	0.033	<0.000
Multiple linear regression: r^2 0.131 F=7.324 p<0.001			

Nine patients were excluded from the regression due to missing date of enrollment. The regression (Table 4) explained 10.2% of the variation in the number of DTPs identified. Age and the total number of medications synchronized had significant positive associations with DTPs identified. The regression was also run for total medications rather than synchronized medications and yielded similar results.

DISCUSSION

The clinical pharmacist administering the telephone based ABM program identified and addressed at least one DTP for three quarters of the 209 patients seen in the study month. The most common interventions related to vaccination recommendation and administration, and adherence counseling. Other authors also have identified the need for vaccines as a potential intervention within a medication synchronization program.[23,33] The periodic ABM interactions between a pharmacist and patient in the present study appear to be a promising opportunity for the pharmacist to engage in personal selling – a relational approach to identifying and meeting patient needs.[34] Utilizing active listening with patients enables the pharmacist to engage, interpret, and evaluate the patient's drug therapy and overall health status.[22]

The adherence counseling and support that was provided by the pharmacist during the appointments suggest there are adherence issues that are not related to the technical process of synchronizing medication refill dates. It appears that with ongoing monitoring, pharmacists can pick up on patterns in patient refill histories and investigate potential issues by asking questions to identify patient barriers to adherence. Studies suggest medication synchronization process of aligning refills and providing reminders leads to more frequent refills, but some of these studies are subject to selection bias and variable clinical contribution by the pharmacist.[15,16,19,20,21,25,35] As a result, the impact of the pharmacist in appointment based models on outcomes like adherence and medication therapy goals is less clear. The present study and another by Andrews *et al*. suggest there is a benefit to having pharmacists regularly engage in clinically focused assessments as part of a continual appointment based model.[17]

This study also provides some evidence for having the primary clinical ABM encounters occur over telephone and supplemented by the availability of the pharmacist when patients pick up their medications. This process is part of the study pharmacy's overall approach to continually monitoring patient medications and documenting drug therapy problems.[30] A comparison study by Barnes *et al*. suggested telephone and face-to-face ABM programs have similar effects on rates of medication refills, although it did not compare the rates or outcomes of clinical interventions by pharmacists.[36] While telephone may have efficiencies, one article found it was difficult to enroll and maintain low-income patients in a telephone-based medication synchronization program – a demographic that may especially benefit from regular conversations with a pharmacist as part of an ABM.[19] More work is needed to better understand the content of the interactions, including the use of more rigorous research designs. It remains challenging to disentangle the pharmacist counseling component from the medication consolidation component of these programs.

The present analysis also tested the influence of patient characteristics on the number of DTPs identified and found no association. Our initial hypothesis was that DTPs would be less frequent for patients enrolled in the ABM program longer. This, however, was not the case as DTPs continued to be identified for patients throughout the range of enrollment durations. The continued identification of DTPs suggests that issues may linger and require ongoing intervention such as belief-based nonadherence. Alternatively, new problems can arise as old issues are resolved. This pattern is consistent with progressive conditions like diabetes where new medications are added periodically to an increasingly complex regimen. A small study on the clinical benefits of medication synchronization on blood pressure control, however, did not show an effect.[22] It was, however, beyond the scope of this cross-sectional study to examine the acceptance of recommendations and follow these patients over time. Future research should follow a cohort of patients using factorial designs that pair medication synchronization with other pharmacy services such as disease state management and examine clinical endpoints in addition to process measures. As expected, the regression did show that age and number of medications was positively associated with DTPs identified. Older patients with polypharmacy may particularly benefit from participating in a clinically oriented ABM program.

These findings have several implications. First, pharmacists may be missing opportunities to identify and manage DTPs if they simply synchronize patient medications and do not continually monitor the medication therapy of patients enrolled in a medication synchronization service. This is consistent with Hinson *et al*. who suggest ABM may improve quality measures and the original premise of the appointment based model.[14,23] Second, this study echoes Luder *et al*. by providing additional support that an appointment-based model can be used to identify patients that need vaccines, such as for seasonal influenza or herpes zoster.[33] It is established that medication synchronization increases refills for enrolled patients. The next frontiers are to test the impact of pharmacist clinical interventions as

part of ABM programs and their effect on clinical outcomes. This could involve pairing the service with disease state management type interventions and assessing using factorial experimental designs.

Limitations

This was a cross sectional analysis of systematic random sample of patients in the ABM program. Patients were not included in the analysis if they did not have an entry for their synchronization. There were many DTPs associated with the need for vaccination given that influenza season was approaching. It is possible that this is a seasonal effect and a different cross-section during a different time of year would yield different results. More work is needed to test such a seasonal difference. The authors made their best effort to categorize the medications for their most common use, but this was not validated for each patient. It also was beyond the scope of this project to analyze the acceptance rate of interventions by the patient and, or the prescriber. The cross-sectional nature of the analysis also did not allow assessing if DTPs were carried forward.

CONCLUSIONS

Using an ABM of medication synchronization that involved a clinical pharmacist routinely assessing patient drug therapy led to the identification of an average of 1.6 DTP per interaction, the most common being the need for additional therapy such as vaccines. The data also suggested that DTPs can be identified and interventions can be made whether the patient is just starting with synchronization or if they have had been participating in the service for multiple years.

CONFLICT OF INTEREST

McDonough and Deninger are co-owners of the study pharmacy and own intellectual property related to the pharmacy clinical documentation software PharmClin. The other authors have no financial disclosures.

FUNDING

The research received no funding.

References

1. Steinman MA, Seth Landefeld C, Rosenthal GE, Berthenthal D, Sen S, Kaboli PJ. Polypharmacy and prescribing quality in older people. J Am Geriatr Soc. 2006;54(10):1516-1523. https://doi.org/10.1111/j.1532-5415.2006.00889.x
2. Zelko E, Klemenc-Ketis Z, Tusek-Bunc K. Medication adherence in elderly with polypharmacy living at home: a systematic review of existing studies. Mater Sociomed. 2016;28(2):129-132. https://doi.org/10.5455/msm.2016.28.129-132
3. Budnitz DS, Lovegrove MC, Shehab N, Richards CL. Emergency hospitalizations for adverse drug events in older Americans. N Engl J Med. 2011;365(21):2002-2012. https://doi.org/10.1056/NEJMsa1103053
4. Budnitz DS, Shehab N, Kegler SR, Richards CL. Medication use leading to emergency department visits for adverse drug events in older adults. Ann Intern Med. 2007;147(11):755-765. https://doi.org/10.7326/0003-4819-147-11-200712040-00006
5. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. Adverse drug events occurring following hospital discharge. J Gen Intern Med. 2005;20(4):317-323. https://doi.org/10.1111/j.1525-1497.2005.30390.x
6. Gandhi TK, Weingart SN, Borus J, Seger AC, Peterson J, Burdick E, Seger DL, Shu K, Federico F, Leape LL, Bates DW. Adverse drug events in ambulatory care. N Engl J Med. 2003;348(16):1556-1564. https://doi.org/10.1056/NEJMsa020703
7. Sarkar U, López A, Maselli JH, Gonzales R. Adverse drug events in U.S. adult ambulatory medical care.. Health Serv Res. 2011;46(5):1517-1533. https://doi.org/10.1111/j.1475-6773.2011.01269.x
8. Hanlon JT, Schmader KE, Samsa GP, Weinberger M, Uttech KM, Lewis IK, Cohen HJ, Feussner JR. A method for assessing drug therapy appropriateness. J Clin Epidemiol. 1992;45(10):1045-1051. https://doi.org/10.1016/0895-4356(92)90144-C
9. Witry MJ, Doucette WR, Gainer KL. Evaluation of the pharmaceutical case management program implemented in a private sector health plan. J Am Pharm Assoc (2003). 2011;51(5):631-635. https://doi.org/10.1331/JAPhA.2011.09137
10. McDonough RP, Doucette WR. Drug therapy management: an empirical report of drug therapy problems, pharmacists' interventions, and results of pharmacists' actions. J Am Pharm Assoc (2003). 2003;43(4):511-518. https://doi.org/10.1331/154434503322226266
11. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. Am J Hosp Pharm. 1990;47(3):533-543.
12. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med. 2005;353(5):487-497. https://doi.org/10.1056/NEJMra050100
13. Association NCP. Medication Adherence in America: A National Report Card http://www.ncpa.co/adherence/AdherenceReportCard_Full.pdf (accessed Oct 6, 2015).
14. Watson LL, Bluml BM. Pharmacy's Appointment Based Model: Implementation Guide for Pharmacy Practice. Washington, DC: APhA Foundation;2013.
15. Holdford DA, Inocencio TJ. Adherence and persistence associated with an appointment-based medication synchronization program. J Am Pharm Assoc (2003). 2013;53(6):576-583. https://doi.org/10.1331/JAPhA.2013.13082
16. Holdford DA, Saxena K. Impact of appointment-based Medication Synchronization on existing users of Chronic Medications. J Manag Care Spec Pharm. 2015;21(8):662-669. https://doi.org/10.18553/jmcp.2015.21.8.662
17. Andrews S, Marcy T, Osborn B, Planas L. The impact of an appointment-based medication synchronization programme on chronic medication adherence in an adult community pharmacy population. J Clin Pharm Ther. 2017;42(4):461-466. https://doi.org/10.1111/jcpt.12533

18. Krumme AA, Isaman DL, Stolpe SF, Dougherty S, Choudhry NK. Prevalence, effectiveness, and characteristics of pharmacy-based medication synchronization programs. Am J Manag Care. 2016;22(3):179-186.
19. Witry M. Appointment-Based Models and Medication Synchronization: Silver Bullet for Adherence or One Piece of the Puzzle? J Manag Care Spec Pharm. 2015;21(8):714. https://doi.org/10.18553/jmcp.2015.21.8.714
20. Girdish C, Shrank W, Freytag S, Chen D, Gebhard D, Bunton A, Choudhry N, Polinski J. The impact of a retail prescription synchronization program on medication adherence. J Am Pharm Assoc (2003). 2017;57(5):579-584. https://doi.org/10.1016/j.japh.2017.05.016
21. Krumme AA, Glynn RJ, Schneeweiss S, Gagne JJ, Dougherty JS, Brill G, Choudhry NK. Medication Synchronization Programs Improve Adherence To Cardiovascular Medications And Health Care Use. Health Aff (Millwood). 2018;37(1):125-133. https://doi.org/10.1377/hlthaff.2017.0881
22. Didonato KL, Vetter KR, Liu Y, May JR, Hartwig M. Examining the effect of a medciation synchronization or an education program on health outcomes of hypertensive patients in a community pharmacy setting. Innov Phar. 2014;5(3):175.
23. Hinson JL, Garofoli GK, Elswick BM. The impact of medication synchronization on quality care criteria in an independent community pharmacy. J Am Pharm Assoc (2003). 2017;57(2):236-240. https://doi.org/10.1016/j.japh.2016.11.008
24. Nguyen E, Sobieraj D. The impact of appointment-based medication synchronization on medication taking behaviour and health outcomes: A systematic review. J Clin Pharm Ther. 2017;42(4):404-413. https://doi.org/10.1111/jcpt.12554
25. Patti M, Renfro CP, Posey R, Wu G, Turner K, Ferreri SP. Systematic review of medication synchronization in community pharmacy practice. Res Social Adm Pharm. 2018 [ahead of print]. https://doi.org/10.1016/j.sapharm.2018.11.008
26. Patterson J, Holdford D. Understanding the dissemination of appointment-based synchronization models using the CFIR framework. Res Social Adm Pharm. 2017;13(5):914-921. https://doi.org/10.1016/j.sapharm.2017.05.022
27. Witry M, Hoang T. Community Pharmacist Attitudes on Medication Synchronization Programs. Inov Pharm. 2017;8(2).
28. Witry MJ, Doucette WR. Community pharmacists, medication monitoring, and the routine nature of refills: a qualitative study. J Am Pharm Assoc (2003). 2014;54(6):594-603. https://doi.org/10.1331/JAPhA.2014.14065
29. Andreski M, Myers M, Gainer K, Pudlo A. The Iowa new practice model: Advancing technician roles to increase pharmacists' time to provide patient care services. J Am Pharm Assoc (2003). 2018;58(3):268-274. https://doi.org/10.1016/j.japh.2018.02.005
30. Goedken AM, Butler CM, McDonough RP, Deninger MJ, Doucette WR. Continuous Medication Monitoring (CoMM): A foundational model to support the clinical work community pharmacists. Res Social Adm Pharm. 2018;14(1):106-111. https://doi.org/10.1016/j.sapharm.2016.12.008
31. Doucette WR, Farris KB, Youland KM, Newland BA, Egerton SJ, Barnes JM. Development of the Drug Adherence Work-up (DRAW) tool. J Am Pharm Assoc (2003). 2012;52(6):e199-e204. https://doi.org/10.1331/JAPhA.2012.12001
32. The American Geriatrics Society Beers Criteria Update Expert P. American Geriatrics Society updated Beers criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2012;60(4):616-631. https://doi.org/10.1111/j.1532-5415.2012.03923.x
33. Luder HR, Kunze N, Heaton PC, Frede SM. An appointment-based model to systematically assess and administer vaccinations. J Am Pharm Assoc (2003). 2018;58(3):290-295. https://doi.org/10.1016/j.japh.2018.02.010
34. McDonough RP, Doucette WR.. Using personal selling skills to promote pharmacy services. J Am Pharm Assoc (2003). 2003;43(3):363-372. https://doi.org/10.1331/154434503321831076
35. Renfro CP, Patti M, Ballou JM, Ferreri SP. Development of a medication synchronization common language for community pharmacies. J Am Pharm Assoc (2003). 2018;58(5):515-521. https://doi.org/10.1016/j.japh.2018.04.032
36. Barnes B, Hincapie AL, Luder H, Kirby J, Frede S, Heaton PC. Appointment-based models: A comparison of three model designs in a large chain community pharmacy setting. J Am Pharm Assoc (2003). 2018;58(2):156-162. https://doi.org/10.1016/j.japh.2018.01.005

Omecene NE, Patterson JA, Bucheit JD, Anderson AN, Rogers D, Goode JR, Caldas LM. Pharmacist-administered pediatric vaccination services in the United States: major barriers and potential solutions for the outpatient setting. Pharmacy Practice 2019 Apr-Jun;17(2):1581.

https://doi.org/10.18549/PharmPract.2019.2.1581

CPPI Practice Forum

Pharmacist-administered pediatric vaccination services in the United States: major barriers and potential solutions for the outpatient setting

Nicole E. OMECENE, Julie A. PATTERSON, John D. BUCHEIT, Apryl N. ANDERSON, Danielle ROGERS, Jean-Venable R. GOODE, Lauren M. CALDAS.

Received (first version): 31-May-2019 Accepted: 14-Jun-2019 Published online: 18-Jun-2019

Keywords

Immunization Programs; Vaccination; Pharmacists; Pharmaceutical Services; Health Services Accessibility; Health Plan Implementation; United States

INTRODUCTION

Pharmacists working in outpatient settings are in a prime position to improve pediatric vaccination rates by recommending, administering, or educating families and patients about vaccines. Pediatric vaccination rates are less than optimal in the United States (U.S.), many falling short of the goals set forth by Healthy People 2020, which may be contributing to pediatric morbidity and mortality.[1] For the 2018-2019 influenza season, less than half of children indicated for vaccination with the influenza vaccine were vaccinated by December and 101 influenza-associated pediatric deaths have occurred as of April 2019.[2,3] For the adolescent population, fewer than 50% received the complete series of the human papillomavirus (HPV) vaccine in 2017 and this same demographic had the lowest influenza vaccination rate of all pediatric age groups at 47.4% in the 2017-2018 influenza season.[4,5]

As more than 90% of the U.S. population lives within two miles of a community pharmacy, pharmacies present an accessible option to improve pediatric vaccination rates and capacity.[6] Beyond location, community pharmacies offer parents and patients a number of other convenience-related benefits, including extended hours of operation, no need for appointments, and locations outside of healthcare facilities.[7-9] Moreover, these conveniences may be especially helpful for routine adolescent vaccinations that require multiple doses at differing intervals, including the HPV and meningococcal vaccines, or for non-routine pediatric vaccinations that are not typically stocked in physician offices, such as travel vaccines or the pneumococcal polysaccharide vaccine.[10] Though literature regarding the effectiveness of pediatric vaccination interventions by community pharmacists is notably lacking, studies have consistently demonstrated improved adult vaccination rates with community pharmacy involvement.[11-16] States with pharmacist vaccination authority overall have higher adult influenza vaccination rates than those without.[15] One could expect similar success of improving vaccination rates in the pediatric population with increased authority for pharmacists.

The Pediatric Pharmacy Advocacy Group (PPAG) released a position paper in 2018 outlining recommendations for increased authority, documentation, advocacy, and continuing education (CE) for pharmacist-administered pediatric vaccines.[17] The recommendations focus on pharmacist and student pharmacist ability to administer influenza, pneumococcal, meningococcal, and HPV vaccines to pediatric patients. Despite advocating for pharmacist involvement in administering vaccines to pediatric patients across all practice sites, the position paper did not discuss how best to implement this service and how student pharmacists should be trained to administer pediatric vaccinations within Doctor of Pharmacy (PharmD) curricula.[17] This article will discuss the implementation of the PPAG position paper recommendations, including key barriers in outpatient settings and potential strategies to successfully incorporate the recommendations into practice. Although other barriers may exist, this article will discuss the regulatory, attitudinal, and logistical barriers associated with pharmacist-administered pediatric vaccines in outpatient settings.

Nicole E. OMECENE. PharmD, BCPPS. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). nomecene@vcu.edu
Julie A. PATTERSON. PharmD, PhD. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). japatterson2@vcu.edu
John D. BUCHEIT. PharmD, BCACP. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). bucheitjd@vcu.edu
Apryl N. ANDERSON. PharmD. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). andersonan@vcu.edu
Danielle ROGERS. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). rogersdj2@mymail.vcu.edu
Jean-Venable "Kelly" R. GOODE. PharmD, BCPS, FAPhA, FCCP. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). jrgoode@vcu.edu
Lauren M. CALDAS. PharmD, BCACP. School of Pharmacy, Virginia Commonwealth University. Richmond, VA (United States). lmcaldas@vcu.edu
Articles in the CPPI Practice Forum section are the sole responsibility of the VCU School of Pharmacy Center for Pharmacy Practice Innovation and do not undergo the standard peer review process of Pharmacy Practice.

https://doi.org/10.18549/PharmPract.2019.2.1581

BARRIERS TO PHARMACIST-ADMINISTERED VACCINES IN OUTPATIENT SETTINGS AND POTENTIAL SOLUTIONS

Regulatory barriers

The PPAG position paper summarizes state-based regulations regarding pharmacist authority to administer pediatric vaccines; therefore, these regulations will not be extensively discussed in this piece.[17] In short, the regulations for pharmacist-administered pediatric vaccines vary significantly according to state. Many states have certain age restrictions for pediatric patients, only give authority for certain vaccines (i.e., influenza vaccine), or may only be administered by a pharmacist via prescription. In fact, very few allow pharmacists to administer any vaccine to any pediatric patient via prescriber protocol.[18] Moreover, student pharmacist authority to vaccinate pediatric patients cannot be assumed based on the authority for pharmacists. Since publication of the position paper, however, states continue to propose and pass legislation to expand pharmacist authority to administer pediatric vaccines highlighting the need to educate and train student pharmacists on administering pediatric vaccines.[19,20] Currently, only three states (Connecticut, Florida, and Vermont) do not allow pharmacists to administer any vaccine to a pediatric patient, suggesting that the vast majority of students will enter into practice with the authority to administer pediatric vaccines.[18] As such, Schools of Pharmacy should prepare their students for this practice because some students may relocate to a state where pharmacists have authority to administer pediatric vaccines or the legislation in that particular state may change, as evidenced by the trend over the past two decades of increased pharmacist authority to administer vaccines.[21]

Presently, under the direct supervision of a pharmacist, student pharmacists have varied authority to vaccinate pediatric patients.[18] The American Pharmacist Association Pharmacy-Based Immunization Delivery Program, which the majority of Schools of Pharmacy use to train student pharmacists, focuses on the practical administration of vaccines to adults only.[22] For pediatric vaccines, students in the program are trained only on immunization schedules and vaccine drug information, but do not practice pediatric injection technique. Therefore, student pharmacists may possess low baseline levels of confidence and comfort in administering pediatric vaccines, which was reported in a majority of students surveyed at one School of Pharmacy.[23] To increase confidence and comfort, Schools of Pharmacy should offer opportunities, as state legislation allows, for student pharmacists to train in pediatric vaccine administration. Experiential pharmacy education and service learning present opportunities to incorporate hands-on pediatric vaccine practice. Outside of coursework, states should expand student pharmacist authority to administer pediatric vaccines to gain practice-based experience, as was recently done in the state of Wisconsin.[24]

Attitudinal Barriers

Physician and parental attitudes may add an additional barrier for pharmacist-administered pediatric vaccines, regardless of legislative authority. Pediatricians surveyed in one study agreed that community pharmacies offer non-traditional delivery sites that could increase vaccination rates, but they expressed concerns about decreased opportunities for follow-up care and lack of comfort with pharmacists administering vaccines to their patients.[25] Another study reported pediatricians and family medicine physicians' concerns about inaccurate or incomplete vaccination records.[26] Additional evidence suggested that physician buy-in with pharmacist-administered HPV vaccination was higher with family medicine physicians than with pediatricians, suggesting that family medicine clinics may be more conducive to expanded pharmacist-administered pediatric immunizations.[27] Community pharmacists could begin by collaborating with physician offices to offer subsequent doses of a vaccine series (e.g., HPV, meningococcal) to patients who received the first dose at their providers' office. Such collaborations would allow the physicians to keep the adolescent well-child visit while also promoting receptivity among physicians and enabling the follow-up dose(s) to be at the convenience of the patient in a community pharmacy setting. In the ambulatory care setting, post-graduate training or board certification in ambulatory care or pediatrics may improve physician comfort with pharmacist-administered pediatric vaccines. Moreover, the creation of a pediatric immunization delivery program for pharmacists could improve physician receptivity, as well as improve comfort and confidence for pharmacists and student pharmacists alike. Additional evidence on the impact of pharmacist involvement on pediatric health outcomes is likely to further increase physician receptivity of the expansion of pharmacist-administered pediatric vaccinations.

At the parent level, previous studies have reported that fewer than half of parents are willing to bring their child to be vaccinated by a pharmacist, although this percentage may be higher for parents of adolescents, with a large majority of parents in one study endorsing pharmacist-administered HPV vaccination.[27-29] Parental concerns may reflect a lack of awareness of pharmacist authority to administer vaccines or perceptions that physician offices are safer places for vaccination.[28,30] Indeed, Shah *et al*. reported that parents who expressed higher satisfaction with their pharmacies and higher belief in pharmacist competence were significantly more likely to endorse pharmacist-administered HPV vaccines.[27] Although beyond the scope of this article, vaccine hesitancy among parents is another major contributing factor to suboptimal pediatric vaccination rates, in which pharmacists could play a key role in educating and debunking myths associated with vaccines.[31,32] Evidence suggests that increasing parental familiarity and experience with pharmacist-administered vaccinations through advocacy may effectively improve parental buy-in.[33]

Logistical barriers

Missed opportunities for vaccination are a clinically relevant risk factor for pediatric patients in the U.S. and preliminary studies suggest that pharmacists can reduce missed vaccination opportunities and vaccine errors in the pediatric ambulatory care setting.[34-36] One study comparing two pediatric clinics in a health-system setting found a significantly reduced number of missed vaccine opportunities and vaccine-related error rates in the clinic

with a pharmacist compared to the clinic without a pharmacist.[35] Furthermore, in a study of pharmacist involvement on an adult primary care team, the pharmacist significantly improved immunization rates for influenza and tetanus-diphtheria-acellular pertussis vaccines by performing an immunization needs assessment, informing the patient of their vaccine needs, and administering the vaccine compared to other non-pharmacist clinicians.[11] A major barrier to pharmacist-administered vaccines in an ambulatory care setting is the workflow within clinics, depending on the clinic type. Nurses typically provide vaccines based on physician recommendations in pediatrician offices. Family medicine clinics may or may not have an established immunization workflow. In either clinic setting, pharmacists may not be involved in the immunization practices, if one is present in the clinic at all. As noted previously, pharmacists in family medicine clinics would be an ideal starting place for this kind of service to enhance pediatric care while decreasing appointment burden on other healthcare professionals. Pharmacists interested in expanding their role in pediatric immunizations in the ambulatory care setting should begin the discussion with their practice site's providers on the need for and evidence supporting additional pharmacist involvement. Depending on the clinic workflow and space, pharmacists could offer specific clinic days for annual influenza vaccinations or for recommending and administering back-to-school immunizations. Although this preliminary evidence for pharmacist involvement in clinic-based pediatric immunization services is positive, more rigorous studies may be needed to further expand practice in the U.S.

Another logistical barrier occurs predominantly in the community pharmacy setting. Pediatric patients less than two years of age require specific positioning for injections into the anterolateral thigh muscle. Additionally, pediatric patients may have a fear of injections further necessitating an additional set of hands to safely position the child to receive a vaccine. Community pharmacists are sometimes the sole healthcare professional at a location, limiting the availability of qualified personnel to assist with this positioning during vaccinations. Anecdotally, families note difficulty finding a pharmacist in the community willing to administer a pediatric vaccine to younger patients, which diminishes the convenience factors mentioned previously. For pharmacists already in practice, CE on the proper anchoring technique for administering vaccines to pediatric patients, especially for those less than two years of age, in addition to the education of student pharmacists discussed previously, could reduce the impact of this barrier. Finally, pharmacies should review their current workflow for adult immunizations and consider the necessary changes needed to accommodate pediatric vaccinations, including screenings for weight and vaccine appropriateness or additional documentation to ensure regulatory compliance.

Finally, complete and accurate immunization documentation is a problem that is not limited to pharmacist-administered vaccines. Electronic medical records are rarely available to clinicians outside a particular health-system and immunization information systems (IIS) may be limited by lack of widespread use.[37,38] Continued advocacy at the state level for pharmacist access to IIS would facilitate pharmacist involvement in administering pediatric vaccines in any outpatient setting. Access to IIS could allow pharmacists to evaluate the vaccine needs of a pediatric patient and the ability to document in IIS would improve vaccine record accuracy and continuity across delivery sites, which may also improve physicians' receptivity.

CONCLUSION

Pharmacists are well positioned to play a key role in tackling the public health concern of low pediatric vaccination rates, as discussed in the 2018 PPAG position paper. The position paper has stimulated conversations surrounding pharmacist-administered pediatric vaccines by outlining recommendations for increased authority, documentation, advocacy, and CE. While there are many barriers to the practical implementation of the PPAG recommendations, outpatient settings are poised to assist in improving pediatric vaccination rates, starting with overcoming the regulatory, attitudinal, and logistical barriers to pharmacist-administered pediatric vaccines. Pharmacists and pharmacy educators should reference the opportunities and strategies in the context of outpatient settings presented here to more effectively incorporate the PPAG recommendations into their practice sites and PharmD curricula.

CONFLICT OF INTEREST

None to declare.

FUNDING

No external funding was received.

References

1. Office of Disease Prevention and Health Promotion. Healthy People 2020 - Immunization and Infectious Diseases. https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases (accessed April 29, 2019).
2. Jenco M. CDC: Flu vaccination rates improved, still too low. AAP News. https://www.aappublications.org/news/2018/12/14/fluvaccine121418 (accessed May 5, 2019).
3. Centers for Disease Control and Prevention. Situation Update: Summary of Weekly FluView Report. https://www.cdc.gov/flu/weekly/summary.htm (accessed May 30, 2019).
4. Walker TY, Elam-Evans LD, Yankey D, Markowitz LE, Williams CL, Mbaeyi SA, Fredua B, Stokley S. National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 Years - United States, 2017. MMWR Morb Mortal Wkly Rep. 2018;67(33):909-917. https://doi.org/10.15585/mmwr.mm6733a1
5. Centers for Disease Control and Prevention. Estimates of Flu Vaccination Coverage among Children — United States, 2017–18 Flu Season. https://www.cdc.gov/flu/fluvaxview/coverage-1718estimates-children.htm#figure1 (accessed May 30, 2019).

6. Drug Store News. Rx Impact: A Drug Store News Special Report. http://www.drugstorenews.com/sites/drugstorenews.com/files/rximpact_2016_0.pdf (accessed May 30, 2019).
7. Skelton JB; American Pharmacists Association; Academy of Managed Care Pharmacy. Pharmacist-provided immunization compensation and recognition: white paper summarizing APhA/AMCP stakeholder meeting. J Am Pharm Assoc (2003). 2011;51(6):704-712. https://doi.org/10.1331/JAPhA.2011.11544
8. Bach AT, Goad JA. The role of community pharmacy-based vaccination in the USA: current practice and future directions. Integr Pharm Res Pract. 2015;4:67-77.
9. Goad JA, Taitel MS, Fensterheim LE, Cannon AE. Vaccinations administered during off-clinic hours at a national community pharmacy: implications for increasing patient access and convenience. Ann Fam Med. 2013;11(5):429-436. https://doi.org/10.1370/afm.1542
10. Houle SK. Pharmacy travel health services: current perspectives and future prospects. Integr Pharm Res Pract. 2018;7:13-20.
11. Higginbotham S, Stewart A, Pfalzgraf A. Impact of a pharmacist immunizer on adult immunization rates. J Am Pharm Assoc (2003). 2012;52(3):367-371. https://doi.org/10.1331/JAPhA.2012.10083
12. Otsuka SH, Tayal NH, Porter K, Embi PJ, Beatty SJ. Improving herpes zoster vaccination rates through use of a clinical pharmacist and a personal health record. Am J Med. 2013 Sep;126(9):832. https://doi.org/10.1016/j.amjmed.2013.02.018
13. Isenor JE, Edwards NT, Alia TA, Slayter KL, MacDougall DM, McNeil SA, Bowles SK. Impact of pharmacists as immunizers on vaccination rates: A systematic review and meta-analysis. Vaccine. 2016;34(47):5708-5723. https://doi.org/10.1016/j.vaccine.2016.08.085
14. Hogue MD, Grabenstein JD, Foster SL, Rothholz MC. Pharmacist involvement with immunizations: a decade of professional advancement. J Am Pharm Assoc (2003). 2006;46(2):168-179. https://doi.org/10.1331/154434506776180621
15. Drozd EM, Miller L, Johnsrud M. Impact of pharmacist immunization authority on seasonal influenza immunization rates across states. Clin Ther. 2017;39(8):1563-1580. https://doi.org/10.1016/j.clinthera.2017.07.004
16. Baroy J, Chung D, Frisch R, Apgar D, Slack MK. The impact of pharmacist immunization programs on adult immunization rates: A systematic review and meta-analysis. J Am Pharm Assoc (2003). 2016;56(4):418-426. https://doi.org/10.1016/j.japh.2016.03.006
17. Meyers R, Weilnau J, Holmes A, Girotto JE. Advocacy Committee on behalf of the Pediatric Pharmacy Advocacy Group. Position Paper: Pharmacists and Childhood Vaccines. J Pediatr Pharmacol Ther. 2018;23(4):343-346. https://doi.org/10.5863/1551-6776-23.4.343
18. American Pharmacist Association. Pharmacist Administered Vaccines. 2019. https://media.pharmacist.com/practice/IZ_Authority_012019_corrected_April_2019.pdf (accessed May 30, 2019).
19. New York Board of Pharmacy. Pharmacists as Immunizers. https://www.health.ny.gov/prevention/immunization/providers/pharmacists_as_immunizers.htm (accessed April 30, 2019).
20. General Assembly of North Carolina. Immunizing Pharmacists. 2019. https://www.ncleg.gov/Sessions/2019/Bills/House/PDF/H388v2.pdf (accessed June 10, 2019).
21. Schmit CD, Penn MS. Expanding state laws and a growing role for pharmacists in vaccination services. J Am Pharm Assoc (2003). 2017;57(6):661-669. https://doi.org/10.1016/j.japh.2017.07.001
22. Prescott WA, Bernhardi C. Immunization Education in US Pharmacy Colleges and Schools. Am J Pharm Educ. 2017 [ahead of print]. https://doi.org/10.5688/ajpe6765
23. Terriff CM, McKeirnan K. Training student pharmacists to administer emergency pediatric influenza vaccine: A comparison of traditional vs. just-in-time training. Curr Pharm Teach Learn. 2017;9(4):560-567. https://doi.org/10.1016/j.cptl.2017.03.006
24. Wisconsin Legislature. Wisconsin Act 42. 2017. http://docs.legis.wisconsin.gov/2017/related/acts/42 (accessed April 29, 2019).
25. Kempe A, Wortley P, O'Leary S, Crane LA, Daley MF, Stokley S, Babbel C, Dong F, Beaty B, Seewald L, Suh C, Dickinson LM. Pediatricians' attitudes about collaborations with other community vaccinators in the delivery of seasonal influenza vaccine. Acad Pediatr. 2012;12(1):26-35. https://doi.org/10.1016/j.acap.2011.07.004
26. Saville AW, Szilagyi P, Helmkamp L, Albertin C, Gurfinkel D, Vangela S, Dickinson LM, Zhou X, Roth H, Kempe A. Potential strategies to achieve universal influenza vaccination for children: provider attitudes in two states. Acad Pediatr. 2018;18(8):873-881. https://doi.org/10.1016/j.acap.2018.07.003
27. Shah PD, Calo WA, Marciniak MW, Gilkey MB, Brewer NT. Support for pharmacist-provided HPV vaccination: National surveys of U.S. physicians and parents. Cancer Epidemiol Biomarkers Prev. 2018;27(8):970-978. https://doi.org/10.1158/1055-9965.EPI-18-0380
28. Calo WA, Gilkey MB, Shah P, Marciniak MW, Brewer NT. Parents' willingness to get human papillomavirus vaccination for their adolescent children at a pharmacy. Prev Med. 2017;99:251-256. https://doi.org/10.1016/j.ypmed.2017.02.003
29. Rand CM, Humiston SG, Schaffer SJ, Albertin CS, Shone LP, Blumkin AK, Stokley S, Szilagyi PG. Parent and adolescent perspectives about adolescent vaccine delivery: practical considerations for vaccine communication. Vaccine. 2011;29(44):7651-7658. https://doi.org/10.1016/j.vaccine.2011.08.002
30. Shah PD, Marciniak MW, Golden SD, Trogdon JG, Golin CE, Brewer NT. Pharmacies versus doctors' offices for adolescent vaccination. Vaccine. 2018;36(24):3453-3459. https://doi.org/10.1016/j.vaccine.2018.04.088
31. Evrony A, Caplan A. The overlooked dangers of anti-vaccination groups' social media presence. Hum Vaccines Immunother. 2017;13(6):1475-1476. https://doi.org/10.1080/21645515.2017.1283467
32. American Academy of Pediatrics. Joint Statement Supporting the VACCINES Act. http://www.aap.org/en-us/about-the-aap/aap-press-room/pages/Joint-Statement-Supporting-the-VACCINES-Act.aspx (accessed June 10, 2019).
33. Deshpande M, Schauer J, Mott DA, Young HN, Cory P. Parents' perceptions of pharmacists as providers of influenza vaccine to children. J Am Pharm Assoc (2003). 2013;53(5):488-495. https://doi.org/10.1331/JAPhA.2013.13017
34. Bardenheier BH, Yusuf HR, Rosenthal J, Santoli JM, Shefer AM, Rickert DL, Chu SY. Factors associated with underimmunization at 3 months of age in four medically underserved areas. Public Health Rep. 2004;119(5):479-485. https://doi.org/10.1016/j.phr.2004.07.005

35. Haas-Gehres A, Sebastian S, Lamberjack K. Impact of pharmacist integration in a pediatric primary care clinic on vaccination errors: A retrospective review. J Am Pharm Assoc (2003). 2014;54(4):415-418. https://doi.org/10.1331/JAPhA.2014.13094
36. Wise KA, Sebastian SJ, Haas-Gehres AC, Moore-Clingenpeel MD, Lamberjack KE. Pharmacist impact on pediatric vaccination errors and missed opportunities in the setting of clinical decision support. J Am Pharm Assoc (2003). 2017;57(3):356-361. https://doi.org/10.1016/j.japh.2017.02.025
37. Centers for Disease Control and Prevention. Vaccination Records. https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/records.html (accessed June 10, 2019).
38. Martin DW, Lowery NE, Brand B, Gold R, Horlick G. Immunization information systems: a decade of progress in law and policy. J Public Health Manag Pract. 2015;21(3):296-303. https://doi.org/10.1097/PHH.0000000000000040

Wood M, Delate T, Stadler SL, Denham AM, Ruppe LK, Hornak R, Olson KL. Trends in high intensity statin use among secondary prevention patients 76 years and older. Pharmacy Practice 2019 Apr-Jun;17(2):1402.
https://doi.org/10.18549/PharmPract.2019.2.1402

Original Research

Trends in high intensity statin use among secondary prevention patients 76 years and older

Michele WOOD, Thomas DELATE, Sheila L. STADLER, Anne M. DENHAM, Leslie K. RUPPE, Roseanne HORNAK, Kari L. OLSON.

Received (first version): 5-Nov-2018 Accepted: 11-Apr-2019 Published online: 29-May-2019

Abstract

Background: High intensity statin therapy (HIST) is the gold standard therapy for decreasing the risk of recurrent atherosclerotic cardiovascular disease (ASCVD); however, little is known about the use of HIST in older adults with ASCVD.

Objectives: The aim of this cross-sequential study was to determine trends in statin intensity in older adults over a 10-year timeframe.

Methods: The study was conducted in an integrated healthcare delivery system. Patients were 76 years or older with validated coronary ASCVD. Data were collected from administrative databases. Statin intensity level was assessed in eligible patients on January 1st and July 1st from January 1, 2007 to December 31, 2016.

Results: Overall, a total of 5,453 patients were included with 2,119 (38.9%) and 3,334 (61.1%) categorized as HIST and Non-HIST, respectively. Included patients had a mean age of 79.8 years and were primarily male and white and had a cardiac intervention. The rate of HIST use increased from 14.5% to 41.3% over the study period (p<0.001 for trend). Conversely, the rates of moderate and low intensity statin use decreased from 61.8% and 9.8% to 41.2% and 4.8%, respectively (both p<0.001 for trend). Similar trends were identified for females and males.

Conclusions: The percentage of patients with ASCVD 76 years and older who received HIST substantially increased from 2007 to 2016. This trend was identified in both females and males. Future comparative effectiveness research should be conducted in this patient population to examine cardiac-related outcomes with HIST and Non-HIST use.

Keywords

Hydroxymethylglutaryl-CoA Reductase Inhibitors; Coronary Artery Disease; Delivery of Health Care, Integrated; Health Services for the Aged; Aged; Prescription Drugs; Comparative Effectiveness Research; Drug Utilization; Retrospective Studies; United States

INTRODUCTION

Atherosclerotic cardiovascular disease (ASCVD) continues to be the leading cause of death in the U.S.[1] The risk of ASCVD increases with age, thus older adults assume the greatest burden of ASCVD risk.[2] While high intensity statin therapy (HIST) is the gold standard therapy for decreasing the risk of ASCVD, there is significant debate surrounding the use of HIST in older adults with ASCVD due to lack of high-quality, randomized controlled trial (RCT) evidence of its effectiveness.[3,4] While the 2013 American College of Cardiology/American Heart Association Task Force (ACC/AHA) guideline on the treatment of blood cholesterol to reduce ASCVD risk in adults does recommend moderate intensity statin therapy (MIST) for patients >75 years of age with clinical ASCVD, the guideline states that there is not enough information to clearly support HIST use in this patient population.[5,6]

Subgroup analyses of older patients have identified a cardiovascular benefit with statin therapy in older patients. For example, the Cholesterol Treatment Trialist's Collaboration Study, using data from 26 RCT, identified that more intensive statin regimens produced further reduction in major vascular events and a similar preventive benefit of statin therapy across all age groups.[7] In addition, a sub-group analysis of Veterans Affairs' patients between 76 to 84 years of age reported significantly lower annual mortality rates in the HIST compared to the MIST groups.[8]

While there is conflicting evidence of an increased protective benefit of HIST in older patients with ASCVD, minimal "real-world" data regarding the use of HIST in patients >75 years with validated ASCVD exist. One cross-sectional study examined HIST use between patients with validated ASCVD >75 and ≤75 years and reported that those >75 years were significantly less likely to receive HIST (23.5% vs. 36.2%, p<0.001).[9] Using claims data to identify patients with unvalidated cardiovascular disease who were >74 years, another cross-sectional study reported that 17.1% of females and 15.1% of males received HIST.[10]

Kaiser Permanente Colorado (KPCO), an integrated health care delivery system providing care to more than 660,000 patients in Colorado at 30 medical offices has a comprehensive cardiac risk reduction service called the Clinical Pharmacy Cardiac Risk Service (CPCRS). The CPCRS is a clinical pharmacy specialist-managed, physician-

Michele WOOD. PharmD. Clinical Pharmacy Specialist. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States) mdw71943@gmail.com
Thomas DELATE. PhD, MS. Clinical Research Scientist; Pharmacy Department; Kaiser Permanente Colorado. Aurora, CO (United States). tom.delate@kp.org
Sheila L. STADLER. PharmD. Clinical Pharmacy Specialist. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States). sheila.l.stadler@kp.org
Anne M. DENHAM. PharmD. Clinical Pharmacy Specialist. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States). anne.denham@kp.org
Leslie K. RUPPE. PharmD. Clinical Pharmacy Specialist. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States). leslieruppe@gmail.com
Roseanne HORNAK. PharmD. Clinical Pharmacy Specialist. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States). rhornak309@gmail.com
Kari L. OLSON. BSc, PharmD. Clinical Pharmacy Supervisor. Pharmacy Department, Kaiser Permanente Colorado. Aurora, CO (United States). kari.olson@kp.org

directed, protocol-driven secondary cardiovascular prevention service that uses a systems-based approach to focus on the long-term medication management of more than 16,000 patients with ASCVD.[11-13] Greater than 95% of KPCO members with ASCVD are enrolled in the CPCRS. Clinical pharmacy specialists review patients enrolled in CPCRS and establish treatment goals collaboratively with physicians. Patients enrolled in CPCRS are managed under collaborative drug therapy management (CDTM) protocols, with each patient being offered all available evidence-based therapies in attempts to attain optimal patient outcomes. The CDTM protocols do not discriminate treatment recommendations based on patient age, thus the decision to use HIST is based on shared-decision making between the clinical pharmacy specialist, patient and physician.

The purpose of this study was to describe the trends over time and identify patient characteristics associated with the application of HIST among patients >75 years of age with validated ASCVD.

METHODS

Study design and setting

This was a retrospective, cross-sequential study of intensity of statin use in older patients with validated ASCVD and enrolled in the CPCRS at KPCO. Kaiser Permanente Colorado utilizes an electronic medical record (EMR) that provides e-prescribing capabilities. In addition, all 30 Denver/Boulder KPCO medical offices have a pharmacy and KPCO provides mail-order services where members are dispensed subsidized prescription medications. Information on prescriptions dispensed from these pharmacies are maintained in KPCO administrative databases. Coded and free-text medical, laboratory, emergency department, hospitalization, and membership information from within the delivery system, as well as from other contracted and affiliated facilities, are captured in KPCO's administrative and claims databases. The KPCO institutional review board reviewed and approved all study activities with a waiver of informed consent.

Study population and procedures

Patients with ASCVD, defined as history of acute myocardial infarction (AMI), coronary artery bypass (CABG), percutaneous coronary intervention with/without stent (PCI) and enrolled in CPCRS were included. Queries of KPCO administrative databases were used to collect data from January 1, 2007 to December 31, 2016. Each calendar year was divided into halves (calendar-half) defined as January 1 to June 30 for the first half and July 1 to December 31 for the second half. The index date was January 1 for the first half of the year and July 1st for the second half of the year. Patients had to be 76 years or older as of the index date to be included in statin intensity assessment for the calendar-half. In addition to being 76 years or older, patients had to have been enrolled in the KPCO CPCRS.[11] Statin intensity level was assessed during each calendar-half of the study time period. Patients could be included in multiple calendar-halves if they met criteria. Patients who had a statin prescription ordered to a non-KPCO pharmacy at any time during the study period were excluded as the accuracy of their dispensing history could not be verified. Patients who received hospice care at any time during the respective calendar-half or died during the 90 days after the index date of the respective calendar-half were also excluded. Patients were categorized as receiving statin therapy if they had a statin dispensed at any time during calendar-half under study. Statin intensity level was determined with the first statin dispensing during each calendar-half year.

Study outcomes

The primary outcome was the trend in rates of statin intensity over a 10-year timeframe in patients with ASCVD who were 76 years or older. Patients were categorized as having received no (NIST), low (LIST), MIST, and HIST during each calendar-half that they were eligible. Trends in intensity level are reported overall and individually by female and male patients. For patients with multiple statin dispensing dates during the respective calendar-half, the statin dispensed on the date most proximal to the index date was used to determine statin intensity level. The second objective was to identify patient characteristics associated with HIST use in patients with ASCVD who were 76 years or older. Patients who had a HIST dispensing in any calendar-half they were eligible were considered a HIST patient while patients who had MIST, LIST, or NIST for all calendar-halves that they were eligible were considered a Non-HIST patient.

Data collection

Information on dispensed prescription medications was obtained from queries of the KPCO electronic Prescription Information Management database using Generic Product Identifier Codes. Information on statins ordered for non-KPCO pharmacies was obtained from the EMR. Information on patient characteristics, including age, membership, and CPCRS enrollment, was obtained from queries of KPCO administrative databases. Patient characteristics were assessed during the six months prior to the index date of the first calendar-half that the patient was categorized as a HIST or Non-HIST patient. Characteristics included information on age, sex, race, Hispanic ethnicity, cardiovascular disease type, comorbidities, non-statin medication dispensings, and socioeconomic status.

Data analysis

No a priori power analysis was performed as this study was primarily descriptive in nature and all patients meeting eligibility criteria during the study period were included. Age was determined as of the index date for each calendar-half. Patients were categorized as HIST, MIST, LSIT, or NIST for each calendar-half and as HIST and Non-HIST overall. Daily doses were calculated using dispensed statin information (drug name, drug strength, quantity dispensed, days of drug supplied) and then categorized by intensity level (online Appendix).[5] Index cardiovascular diseases were categorized as AMI, AMI + cardiac intervention, and cardiac intervention only. Interventions included CABG and PCI. Tobacco use included cigarette, pipe, chew, snuff, and vapor use.

A chronic disease score (CDS), a validated measure of the burden of chronic illness, was calculated for each patient

Table 1. Baseline Characteristics by Statin Intensity Status (N=5453)

Characteristic	High Intensity Statin Use (n=2119)	No, Low, Moderate Intensity Statin Use (n=3334)	p-value
Mean Age[a] (years, SD)	78.5 (3.4)	80.7 (5.0)	<0.001
Female (n, %)	766, 36.2%	1411, 42.3%	<0.001
White Race (n, %)	1803, 85.1%	2650, 79.5%	<0.001
Hispanic Ethnicity (n, %)	153, 7.2%	228, 6.8%	0.590
Cardiovascular Disease Type (n, %)			
AMI Only	349, 16.5%	827, 24.8%	<0.001
AMI + Intervention[b]	670, 31.6%	1023, 30.7%	0.467
Intervention[b] Only	1100, 51.9%	1484, 44.5%	<0.001
Tobacco Use (n, %)	268, 12.7%	380, 11.4%	0.165
Comorbidity Diagnosis[c] (n, %)			
Cerebrovascular Disease	212, 10.0%	381, 11.4%	0.100
Depression	242, 11.4%	335, 10.1%	0.108
Diabetes Mellitus	623, 29.4%	843, 25.3%	<0.001
Heart Failure	395, 18.6%	705, 21.2%	0.025
Hypertension	1321, 62.3%	2030, 60.9%	0.283
Pulmonary Disease	495, 23.4%	845, 25.3%	0.097
Peripheral Vascular Disease	387, 18.3%	483, 14.5%	<0.001
Renal Disease	600, 28.3%	834, 25.0%	0.007
Rheumatologic Disease	47, 2.2%	105, 3.2%	0.041
Medications (n, %)			
Anti-Platelet[d]	580, 27.4%	728, 21.8%	<0.001
Angiotensin II Receptor Blocker[d]	344, 16.2%	477, 14.3%	0.052
Angiotensin Converting Enzyme Inhibitor[d]	931, 43.9%	1441, 43.2%	0.604
Beta-Blocker[d]	1645, 77.6%	2403, 72.1%	<0.001
OTC Aspirin	2035, 96.0%	3083, 92.5%	<0.001
Mean Chronic Disease Score[d] (SD)	6.0 (2.9)	6.1 (3.1)	0.001
Mean Charlson Comorbidity Index[c] (SD)	2.4 (2.3)	2.3 (2.3)	0.282
Mean Family Income (SD)	USD 64303 (USD 22511)	USD 61880 (USD 22283)	<0.001
Mean Percent of Household with at Least Some College Education (SD)	64.5% (18.3)	62.9% (18.5)	0.003

a - As of index date
b - Interventions include coronary artery bypass grafts and percutaneous coronary interventions
c - From diagnoses recorded during the 180 days prior to index date
d - From prescription medication dispensings during the 180 days prior to index date
AMI - acute myocardial infarction, SD - standard deviation

using ambulatory prescription medication dispensings.[14] The CDS ranges in values from 0 to 36 with increasing values indicating a higher burden of chronic illness. The presence of specific comorbidities was determined using the Quan adaptation of the Charlson comorbidity index (CCI).[15] The algorithm was applied to diagnoses to provide a 30-point comorbidity score for each patient.

The percentages of patients in each intensity level was determined by summing the total count of patients per intensity level per calendar-half and dividing this value by the total count of patients eligible for inclusion in the calendar-half. Percentages are reported overall and separately by females and males. Percentages were graphed to illustrate trends in intensity level over a 10-year period. The Cochran-Armitage test was used to assess for linear trends, overall, in statin intensity over time.

Patient characteristics are reported as means, medians, and standard deviations for interval- and ratio-level variables (e.g., age) and percentages for nominal- and ordinal-level data (e.g., sex, co-morbidity history). Comparisons between the HIST and Non-HIST groups were made with parameteric/non-parametric t-tests, as applicable, for interval- and ratio-level data and chi-square tests of association for nominal- and ordinal-level data. An adjusted logistic regression model was constructed with HIST use as the dependent variable and patient characteristics as the independent variable to determine factors independently associated with HIST use. Characteristics included in the model (age, sex, CDS, CCI, race, Hispanic ethnicity, tobacco use, cardiovascular disease type, congestive heart failure (CHF), peripheral vascular disease (PVD), diabetes, renal disease, hypertension, and depression comorbidities, anti-platelet, angiotensin II receptor blocker, angiotensin converting enzyme inhibitor, and beta-blocker dispensing, and over-the-counter (OTC) aspirin use) were determined based on clinical judgement and univariate analysis. The alpha was set at 0.05.

Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All aspects of the study were reviewed and approved by the KPCO Institutional Review Board.

RESULTS

A total of 5,453 patients were included. Patients, overall, had a mean age of 79.8 years, were primarily male, white, and non-Hispanic, had a high burden of chronic disease, and their cardiovascular disease was identified from a

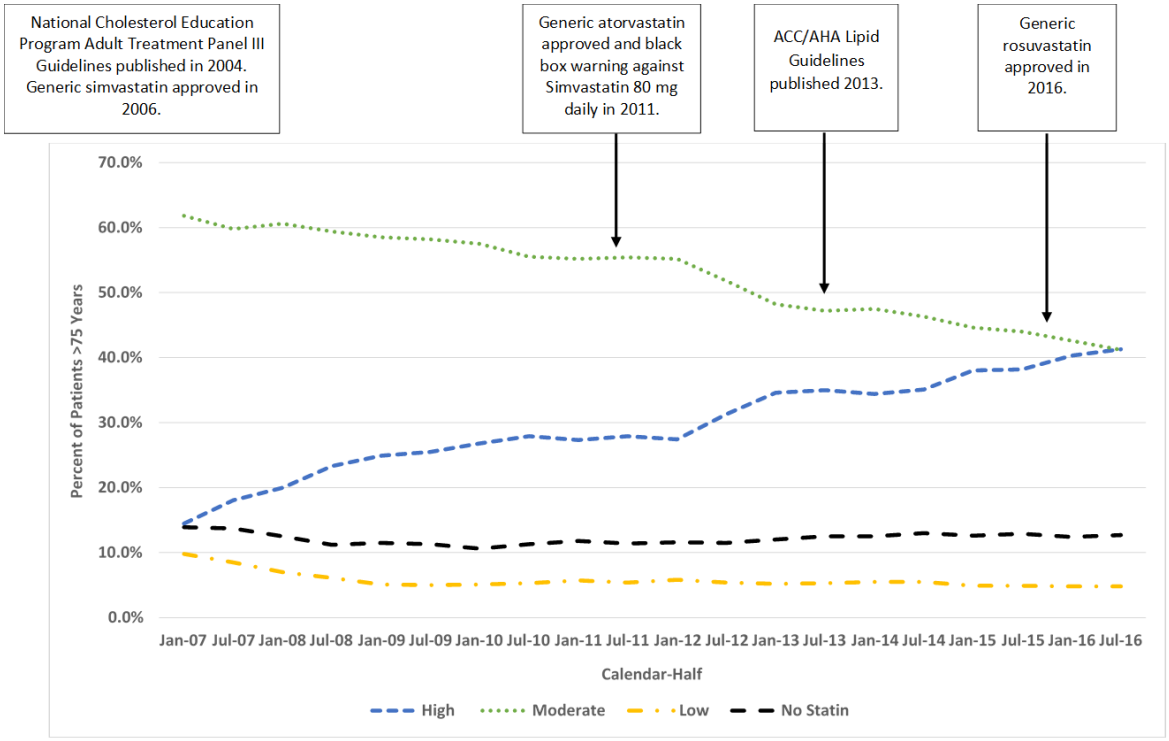

Figure 1. Statin intensity levels overall

cardiac intervention (Table 1). Approximately 2% of patients were excluded for using non-KPCO pharmacies. Overall, the percentage of patients who received HIST increased from 14.5% as of January 1, 2007 to 41.3% as July 1, 2016 ($p<0.001$ for trend) (Figure 1). Conversely, the percentage of patients who received MIST and LIST decreased from 61.8% and 9.8% as of January 1, 2007 to 41.2% and 4.8% as July 1, 2016, respectively (both $p<0.001$ for trend). The percentage of patients who received no statin fluctuated but remained in the 13-14% range ($p>0.05$ for trend). There were 801 (14.7%) patients who were titrated from a lower intensity statin to HIST during the study period.

Similar trend patterns were seen for females (Figure 2) and males (Figure 3). The percentage of females and males who received HIST increased from 14.3% and 14.6% as of January 1, 2007 to 38.5% and 43.0% as July 1, 2016, respectively, while MIST use decreased from 60.2% and 63.0% as of January 1, 2007 to 41.3% and 41.1% as July 1, 2016, respectively. The percentage of female and male patients who received LIST decreased approximately by half over the study period while the percentages who received no statin fluctuated over a narrow range.

Overall, a total of 2,119 (38.9%) and 3,334 (61.1%) patients were categorized as HIST and Non-HIST, respectively. In univariate analysis, HIST patients had lower mean age and CDS with higher mean family income and percent of household with some college education (all $p<0.05$) (Table 1). HIST patients were more likely to be male and white, have had only a cardiac intervention, have PVD, diabetes,

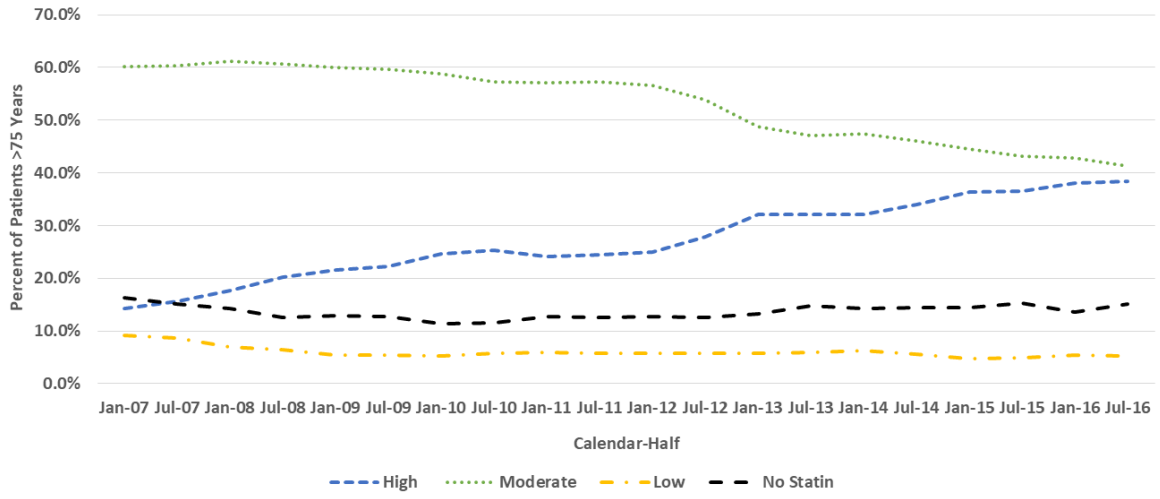

Figure 2. Statin intensity levels for females

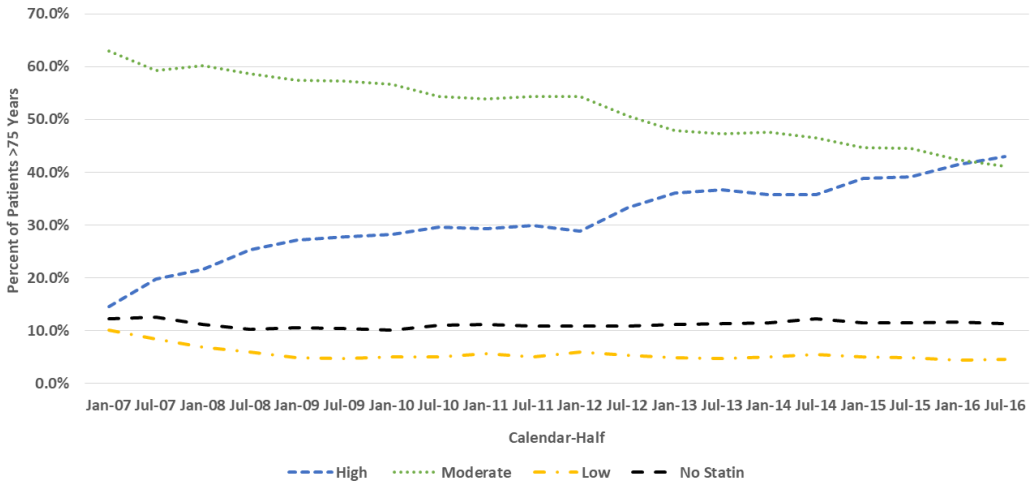

Figure 3. Statin intensity levels for males

and renal disease, had a dispensing of anti-platelet and beta-blocker medication, and had OTC aspirin use (all p<0.05). Non-HIST patients were more likely to have had an AMI only and have CHF and a rheumatologic disease.

In multivariable analysis, factors independently associated with having received HIST include white race (adjusted odds ratio (aOR)=1.51), depression (aOR=1.28), PVD (aOR=1.32), and renal disease (aOR=1.27) comorbidities, anti-platelet (aOR=1.42) and beta-blocker (aOR=1.37) dispensings, and OTC aspirin use (aOR=1.52) (Table 2). Factors associated with being less likely to having received HIST include age (aOR=0.89), female sex (aOR=0.88), CDS (aOR=0.96), and AMI only (aOR=0.71) and AMI + intervention (aOR=0.88) compared to intervention only.

DISCUSSION

This retrospective trend analysis of over 5,400 patients with ASCVD who were 76 years and older identified that the percentage of patients who received HIST increased by approximately 1.9 times over a 10-year study period. This increase was offset by decreases in MIST and LIST as the percentages of patients who received MIST and LIST decreased by approximately one third and half, respectively, over the study period. In contrast, the percentage of patients who received no statin fluctuated slightly over the study period. These trends in statin intensity were similar for both females and males. To our knowledge, this is the first study to examine 10-year trend in HIST use in female and male patients with validated ASCVD who were 76 years and older. Our findings are

Table 2. Factors Associated with High Intensity Statin Use

Factor	Odds Ratio	95% Confidence Interval
Age	0.89	0.88 - 0.91
Female Sex	0.88	0.78 - 0.99
Charlson Comorbidity Index	0.99	0.94 - 1.04
Chronic Disease Score	0.96	0.94 - 0.99
White Race	1.51	1.26 - 1.81
Hispanic Ethnicity	1.25	0.96 - 1.63
Cardiovascular Disease Type (n, %)		
AMI Only	0.71	0.60 - 0.83
AMI + Intervention	0.88	0.77 - 0.99
Intervention Only	---	-----
Tobacco Use (n, %)	0.97	0.81 - 1.57
Comorbidity Diagnosis (n, %)		
Cerebrovascular Disease	0.86	0.70 - 1.05
Depression	1.28	1.05 - 1.54
Diabetes Mellitus	1.15	0.99 - 1.35
Heart Failure	0.99	0.83 - 1.17
Hypertension	1.03	0.90 - 1.17
Pulmonary Disease	0.94	0.80 - 1.10
Peripheral Vascular Disease	1.32	1.11 - 1.57
Renal Disease	1.27	1.06 - 1.52
Rheumatologic Disease	0.73	0.50 - 1.05
Medications (n, %)		
Anti-Platelet	1.42	1.24 - 1.63
Angiotensin II Receptor Blocker	1.11	0.93 - 1.32
Angiotensin Converting Enzyme Inhibitor	1.07	0.93 - 1.23
Beta-Blocker	1.37	1.19 - 1.57
OTC Aspirin	1.52	1.16 - 1.99

AMI - acute myocardial infarction

important since they provide information from a large cohort of a patient population that has been underrepresented in analyses of statin intensity for secondary prevention and suggest that practitioners are adjusting and initiating statin dosing to the highest intensities despite guideline ambivalence of HIST effectiveness.

Few other studies have assessed HIST use in older patients with ASCVD. The PALM registry study assessed a cross-sectional subset of patients with ASCVD (n=1038) who were >75 years and identified that 23.5% of patients in the study received HIST as of 2015.[9] The investigators did not perform analysis of their sample by patient sex. Our finding of 38.0% HIST use, overall, as of January 1, 2015 is numerically a considerably higher percent of patients who received HIST. Our finding may be different since we only included patients with coronary ASCVD (i.e., AMI, CABG, PCI with or without stent) while PALM included a broader range of patients with clinical ASCVD. In addition, the PALM patients were from diverse clinics (potentially with and without DSM services) while ours were patients managed by a clinical pharmacy cardiac risk service.[9] Rosenson and colleagues assessed statin intensity with claims data among patients >75 years 30 days after hospital discharge with a myocardial infarction diagnosis.[16] They reported that from 2011 through 2014, the percentage of patients who had a HIST prescription dispensed increased from 19.2% to 47.4%.[16] During a similar time period, we observed an increase in HIST dispensings from 27.3% to 35.1%. Our findings may have differed since Rosenson and colleagues only assessed patients within 30 days after hospital discharge for an acute MI and excluded patients who received simvastatin.[16] A recent study of CPCRS patients with ASCVD evaluated trends in HIST use in younger patients (i.e., 21-75 years old). Similar trends in HIST use were identified with HIST use increasing from 44% in 2007 to 67% in 2016 ($p< 0.001$ for trend).[17]

There are potential elements that may have influenced the increase in HIST use we observed in our cohort. The fastest rate of increase in HIST use that we observed occurred prior to 2011 (2007 - 2010, 0.9x vs. 2011 - 2016, 0.5x). The increasing use of HIST during the earlier years of our study may have been driven by the CPCRS CDTM protocol that emphasized an LDL-Cholesterol (LDL-C) goal <70 mg/dL after the publication of the National Cholesterol Education Program Adult Treatment Panel III guidelines.[18] In addition, these guidelines endorsed that older patients will benefit from therapeutic lowering of LDL-C.[18] Furthermore, the availability of generic simvastatin in 2006 (immediately preceding our study period) provided practitioners with a statin that could be dosed easily at high intensity levels (e.g., 80 mg tablet once daily) at an affordable cost.[19] During the latter years of our study, the availability of generic atorvastatin in late 2011 and rosuvastatin in early 2016 provided less expensive and more tolerable HIST while the black-box warning applied to simvastatin 80 mg in mid-2011 likely provided an impetus for increased use of atorvastatin.[19] Furthermore, the release of the 2013 ACC/AHA Lipid Guidelines promoted changes to the CPCRS CDTM protocol to focus on reaching HIST and then assessing LDL-C goal.[5] Combined, these elements likely drove increased HIST use.

Besides the temporal trend in increased use of HIST, we identified numerous factors that were associated independently with HIST (younger, male, and white patients and those with a lower burden of chronic disease, a dispensing of an anti-platelet or beta-blocker, and a depression, PVD, or renal disease comorbidity). Rosenson and colleagues identified that males and a beta-blocker or antiplatelet dispensing were associated with HIST.[16] The PALM registry study reported that younger age was associated with HIST.[9] A fascinating finding from our study was that patients with an AMI without an intervention were less likely to have received HIST than patients who underwent a cardiac intervention. We hypothesize that some of the AMI were not driven by atherosclerosis but takotsubo cardiomyopathy, vasospasm, or dissection; thus, HIST may not be appropriate therapy for such patients.

Another interesting yet reasonable finding was that patients with a higher burden of chronic illness were less likely to have received HIST. Such patients may have poorer prognoses and use of HIST may not have affected their outcomes. That patients with a depression comorbidity were more likely to have received HIST is a noteworthy finding; however, it may simply be related to these patients utilizing the health system more frequently, thus, increasing their chances of follow up with a clinical pharmacist or other lipid-focused practitioner. It is rational that patients with PVD were more likely to have received HIST since their PVD along with ASCVD were both indications for statin therapy. Finally, that patients with renal disease were more likely to be HIST is logical since these patients are at very high risk for cardiac-related morbidity and mortality.

While we identified that 41.4% of patients with coronary ASCVD 76 years and older had received HIST at the end of our study period, it is reasonable to expect that this rate could have been and currently might be higher. The CDTM protocol that the CPCRS practices under lists advanced age as a mitigating circumstance to alter treatment strategies based on statin tolerance and other patient specific factors.[13] In practice, this may have manifested in patients with advanced age being treated less aggressively as patients with an intolerance were treated with a lower intensity statin or no statin. If positive evidence accumulates on HIST-related outcomes in patients with ASCVD older than 76 years, practice may modify and optimize statin therapy to HIST in these patients.

Limitations

Our study captured a large number of outpatient adults with validated coronary ASCVD 76 years and older. We used broad entry criteria to study a diverse population that included both incident and prevalent statin users. Nevertheless, our study did have limitations. We relied on pharmacy dispensing records to determine statin intensity. We excluded patients who filled statins at non-KPCO pharmacies as we were unable to pull administrative data from these pharmacies. We do not suspect this impacted our overall findings as the proportion excluded for this reason was low (2%). Patients may have received instructions from their practitioner (e.g., split tablet and take half tablet per day) that were not captured in the pharmacy database. To offset this potential bias, we

included all CPCRS patients, whether they had a dispensing for statin therapy or not, to provide a more precise HIST rate. In patients with multiple statin prescriptions, we assessed the first statin dispensed during the calendar-half instead of choosing the highest intensity statin dispensed. We took this as a more conservative approach to HIST use. Patients with ASCVD who were not managed in a DSM were not included so there was no comparator group. In addition, our study was conducted in one integrated health system, thus, our findings may not be generalizable to other systems. As some of our findings were confirmatory of other studies' findings, the importance of our findings is likely generalizable to other systems. We did not assess changes in LDL-C with use of HIST. We examined a limited number of factors in our multivariate analysis. Other factors such as adverse statin reactions, previous statin intolerability, or patient-specific factors (e.g., benefit design, low LDL) may have contributed to Non-HIST use.

CONCLUSIONS

This study identified that the percentage of patients with ASCVD 76 years and older who received HIST substantially increased from 2007 to 2016. This trend was identified in both females and males. Patient factors independently associated with HIST included younger age, male, and white patients and patients with a lower burden of chronic disease, a dispensing of an anti-platelet or beta-blocker, and a depression, PVD, or renal disease comorbidity. Future comparative effectiveness research should be conducted in this patient population to examine cardiac-related outcomes with HIST use as evidence to support HIST use in this patient population is lacking.

CONFLICT OF INTEREST

The authors have no conflicts of interest or financial interests in any product or service mentioned in the article to report.

FUNDING

This study was funded by the Kaiser Permanente Colorado Pharmacy Department. The funder had no role in the study design, collection, analysis and interpretation of data, writing of the report, or the decision to submit the manuscript for publication.

References

1. Mozaffarian D, et al. Heart disease and stroke statistics— 2015 update: a report from the American Heart Association. Circulation. 2015;131(4):e29-e322. https://doi.org/10.1161/CIR.0000000000000152
2. Goff DC Jr, Lloyd-Jones DM, Bennett G, Coady S, D'Agostino RB Sr, Gibbons R, Greenland P, Lackland DT, Levy D, O'Donnell CJ, Robinson JG, Schwartz JS, Shero ST, Smith SC Jr, Sorlie P, Stone NJ, Wilson PWF. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014;63(25 Pt B):2935-2959. https://doi.org/10.1016/j.jacc.2013.11.005
3. O'Brien EC, Wu J, Schulte PJ, Christian A, Laskey W, Bhatt DL, Peterson ED, Hernandez AF, Fonarow GC. Statin use, intensity, and 3-year clinical outcomes among older patients with coronary artery disease. Am Heart J. 2016;173:27-34. https://doi.org/10.1016/j.ahj.2015.11.014
4. Ko DT, Mamdani M, Alter DA. Lipid lowering therapy with statins in high-risk elderly patients: the treatment paradox. JAMA. 2004;291(15):1864-1870. https://doi.org/10.1001/jama.291.15.1864
5. Stone NJ, Robinson JG, Lichtenstein AH, Bairey Merz CN, Blum CB, Eckel RH, Goldberg AC, Gordon D, Levy D, Lloyd-Jones DM, McBride P, Schwartz JS, Shero ST, Smith SC Jr, Watson K, Wilson PW; American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014;63(25 Pt B):2889-2934. https://doi.org/10.1016/j.jacc.2013.11.002
6. Wilmot KA, Khan A, Krishnan S, Eapen DJ, Sperling L. Statins in the elderly: a patient-focused approach. Clin Cardiol. 2015;38(1):56-61. https://doi.org/10.1002/clc.22338
7. Cholesterol Treatment Trialists' (CTT) Collaboration, Baigent C, Blackwell L, Emberson J, Holland LE, Reith C, Bhala N, Peto R, Barnes EH, Keech A, Simes J, Collins R. Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170,000 participants in 26 randomised trials. Lancet. 2010;376(9753):1670-1681. https://doi.org/10.1016/S0140-6736(10)61350-5
8. Rodriquez F, Maron D, Knowles JW, Virani SS, Lin S, Heidenreich PA. Association between intensity of statin therapy and mortality in patients with atherosclerotic cardiovascular disease. JAMA Cardiol. 2017;2(1):47-54. https://doi.org/10.1001/jamacardio.2016.4052
9. Nanna MG, Navar AM, Wang TY, Mi X, Virani SS, Louie MJ, Lee LV, Goldberg AC, Roger VL, Robinson J, Peterson ED. Statin use and adverse effects among adults > 75 years of age: insights from the patient and provider assessment of lipid management (PALM) registry. J Am Heart Assoc. 2018;7(10):e008546. https://doi.org/10.1161/JAHA.118.008546
10. Musich S, Wang SS, Schwebke K, Slindee L, Waters E, Yeh CS. Underutilization of statin therapy for secondary prevention of cardiovascular disease among older adults. Popul Health Manag. 2019;22(1):74-82. https://doi.org/10.1089/pop.2018.0051
11. Sandhoff BG, Nies LK, Olson KL, Nash JD, Rasmussen JR, Merenich JA. Clinical pharmacy cardiac risk service for managing patients with coronary artery disease in a health maintenance organization. Am J Health Syst Pharm. 2007;64(1):77-84. https://doi.org/10.2146/ajhp060022
12. Merenich JA, Olson KL, Delate T, Rasmussen J, Helling DK, Ward DG; Clinical Pharmacy Cardiac Risk Service Study Group. Mortality reduction benefits of a comprehensive cardiac care program for patients with occlusive coronary artery disease. Pharmacotherapy. 2007;27(10):1370-1378. https://doi.org/10.1592/phco.27.10.1370

13. Todd BA, Lamprecht DG, Stadler SL. Pharmacist prescribing practices in a clinical pharmacy cardiac risk service. Am J Health Syst Pharm. 2016;73(18):1442-1450. https://doi.org/10.2146/ajhp150781
14. Clark DO, Von Korff M, Saunders K, Baluch WM, Simon GE. A chronic disease score with empirically derived weights. Med Care. 1995;33(8):783-795.
15. Quan H, Sundararajan V, Halfon P, Fong A, Burnand B, Luthi JC, Saunders LD, Beck CA, Feasby TE, Ghali WA. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. Med Care. 2005;43(11):1130-1139.
16. Rosenson RS, Farkouh ME, Mefford M, Bittner V, Brown TM, Taylor B, Monda KL, Zhao H, Dai Y, Muntner P. Trends in use of high-intensity statin therapy after myocardial infarction, 2011 to 2014. J Am Coll Cardiol. 2017;69(22):2696-2706. https://doi.org/10.1016/j.jacc.2017.03.585
17. Lamprecht DG, Shaw PB, King JB, Hogan KN, Olson KL. Trends in high-intensity statin use and low density lipoprotein cholesterol control among patients enrolled in a clinical pharmacy cardiac risk service. J Clin Lipidol. 2018;12(4):999-1007. https://doi.org/10.1016/j.jacl.2018.04.007
18. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC Jr, Stone NJ; Coordinating Committee of the National Cholesterol Education Program. Coordinating Committee of the National Cholesterol Education Program. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. Arterioscler Thromb Vasc Biol. 2004;24(8):e149-e161. https://doi.org/10.1161/01.ATV.0000133317.49796.0E
19. Salami JA, Warraich H, Valero-Elizondo J, Spatz ES, Desai NR, Rana JS, Virani SS, Blankstein R, Khera A, Blaha MJ, Blumenthal RS, Lloyd-Jones D, Nasir K. National trends in statin use and expenditures in the US adult population from 2002 to 2013: insights from the medical expenditure panel survey. JAMA Cardiol. 2017;2(1):56-65. https://doi.org/10.1001/jamacardio.2016.4700

Anderson CR, Lueckler J, Olson JA. Influencing the timing of parenteral nutrition initiation in the pediatric intensive care unit. Pharmacy Practice 2019 Apr-Jun;17(2):1416.
https://doi.org/10.18549/PharmPract.2019.2.1416

Original Research

Influencing the timing of parenteral nutrition initiation in the pediatric intensive care unit

Collin R. ANDERSON, Jennifer LUECKLER, Jared A. OLSON.
Received (first version): 23-Nov-2018 Accepted: 26-May-2019 Published online: 6-Jun-2019

Abstract

Background: Lack of benefit and potential harm of early parenteral nutrition (PN) initiation in critically ill children was highlighted in the 2016 published results of a large multicenter, randomized controlled trial.

Objectives: The purpose of this project was to implement a process to delay PN initiation for up to five days after admission to our pediatric intensive care unit (PICU).

Methods: Patients greater than thirty days of age, admitted to the PICU beginning July 1, 2016 were included in the analysis of the healthcare improvement initiative to decrease early PN initiation. A meeting was held with PICU fellows, attending physicians, dietitians, and pharmacists to reach a consensus to delay initiation of parenteral nutrition until PICU day five. The dietitian, with pharmacist support, reiterated recommendations on rounds and in formal notes.

Results: A total of 2333 patients were identified in the pre-intervention group and a total of 2491 patients in the post-intervention group. The percentage of patients receiving PN prior to day five within the PICU was 5.5% in the pre-intervention group versus 3.1% in the delayed PN group (p<0.001). PICU patients receiving PN less than or equal to three days decreased from 2.6% pre-intervention to 1.5% post-intervention (p=0.01). For the subset of patients who were initiated on PN after admission to the PICU, median PICU length of stay was 7 days versus 6 days in the pre-intervention versus post-intervention group (p=0.26).

Conclusions: Decrease in PN utilization was seen in the pre and post-intervention groups as assessed by percentage of patients initiated on PN prior to day five of PICU admission. Consensus among practitioners with consistent recommendations from the frontline dietitian and pharmacist, with nutrition support team collaboration, contributed to the evidence based quality initiative results. Delaying PN did not adversely affect length of stay pre versus post-intervention.

Keywords

Parenteral Nutrition; Infant; Time Factors; Intensive Care Units, Pediatric; Pharmacists; Nutritionists; Consensus; Length of Stay; Non-Randomized Controlled Trials as Topic; Utah

INTRODUCTION

Clinical trials in both adults and children have questioned the benefit of early parenteral nutrition (PN). The adult early versus late PN study from 2011 supported late initiation of PN.[1] These results were incorporated into the 2016 adult critical care nutrition guidelines.[2] The pediatric community was hesitant to extrapolate the adult results to children due to pediatric ontogenesis. Children have nutritional growth demands in addition to their maintenance metabolic requirements, making many reluctant to withhold parenteral nutrition to those patients not receiving goal caloric intake via the enteral route during hospitalization. Without trial results indicating otherwise, provision of earlier PN in pediatrics in comparison with adults was generally accepted.

A large pediatric multicenter, randomized controlled trial (RCT), delaying PN for one week in critically ill pediatric patients resulted in decreased length of stay, shorter duration of mechanical ventilator support, and decreased incidence of infection.[3] The publication generated controversy as evidenced by letters to the editor questioning methodology and discounting the external applicability of the study along with its conclusions.[4,5] Within our institution some practitioners were hesitant upon initial discussion to move toward later initiation of PN. Prior to the RCT pediatric study, practice varied within our pediatric intensive care unit (PICU) regarding when to initiate PN and was heavily dependent upon attending physician preference. Historically at our institution, many practitioners opted to initiate early PN within the first three days of admit in those patients not meeting goal caloric intake. The RCT provided outcomes based evidence supporting a later initiation of PN than was customary at our site.

Primary literature is a catalyst for evaluation of local, cultural prescribing and can lead change in clinical practice. Primary literature also influences national consensus recommendations, although guideline changes occur over a longer time period and often lag local changes already made in response to study publication. The large RCT included objective outcomes favoring delayed PN and provided impetus for practice change and greater standardization regarding timing of PN initiation at our institution.

At the time of the pediatric early versus late PN publication in 2016 outlining the benefits of late PN initiation, pediatric critical care guidelines were absent of recommendations regarding timing of PN initiation. Given the available primary literature, the PICU and nutrition support team

Collin R. ANDERSON. PharmD, PhD, BCPS. Clinical Manager, Department of Pharmacy, Intermountain Healthcare Primary Children's Hospital. Salt Lake City, UT (United States). collin.anderson@imail.org
Jennifer LUECKLER, RDN, CSP, Clinical Dietitian, Intermountain Healthcare Primary Children's Hospital. Salt Lake City, UT (United States). jennie.lueckler@imail.org
Jared A. OLSON, PharmD, BCPPS, Infectious Disease Stewardship Pharmacist, Intermountain Healthcare Primary Children's Hospital. Salt Lake City, UT (United States). jared.olson@imail.org

moved to develop a more consistent approach in the timing for initiation of PN in the critically ill child. The objective of our healthcare improvement initiative was to decrease the percentage of patients initiated on PN prior to day five within the PICU.

METHODS

Inclusion

We performed a retrospective, pre/post quasi-experimental study of patients admitted to the PICU during the eighteen month period between July 1, 2016 and December 31, 2017. Our comparator group included patients admitted to the PICU between January 1, 2015 and June 30, 2016. The patients were required to be admitted to the PICU within the first 24 hours of admission and be greater than or equal to 30 days old at hospital admit.

Exclusion

Patients admitted to the PICU currently receiving PN were excluded. Patients within the NICU and cardiac intensive care unit (CICU) were excluded. NICU patients were excluded, as the quality initiative was based on a large RCT for PICU patients which excluded preterm neonates. CICU patients were excluded because our CICU was in process of conducting a quality project surrounding implementation of standard feeding protocols, which included PN recommendations.

Aim

The primary aim of the project was to decrease the PN initiation rate for patients in the first four days following PICU admission. The secondary aim was to decrease the percentage of patients receiving PN three days or less. Success was defined as decreasing the percentage of patients initiated on PN prior to day five within the PICU. Surveillance of length of stay was conducted to ensure the intervention was not adversely affecting the local patient population.

Key Drivers

The key drivers were 1) collaboration between dietitian, prescriber and pharmacist and 2) dissemination of recent evidence for PN initiation within the PICU population.

Approach

During the second quarter of 2016, formal review of published RCT results evaluating early versus late PN initiation occurred within the multi-disciplinary nutrition support team composed of physician, dietitian, nurse, and pharmacy representation. Concurrent to the nutrition support team evaluation, the PICU physician group reviewed the RCT during a journal club presented by a PICU fellow. A subsequent meeting was scheduled between the two groups to determine a unified recommendation for PN initiation within the PICU. It was determined that individualized PN would be initiated on day five from PICU admission in patients unable to receive adequate enteral nutrition. We did not change our aim to initiate enteral nutrition support within 48 hours of PICU admission and achieve 60% of goal feeding rate within seven days of admission. Enteral nutrition continued to be generally provided via NG and initiated at a trophic rate (<25% of goal volume) with periodic rate advancement to goal volume within 24-48 hours.

Education

The dietitian and pharmacist jointly write PN orders for patients within the PICU, with final approval of a PN order by a physician or nurse practitioner. Formal education of pharmacy and dietitian personnel was provided during regularly scheduled meetings, regarding the rationale and decision to initiate PN on day five from PICU admission in patients failing to reach nutritional goals. A computer based required competency for dietitians was drafted to include the PN initiation recommendation. Residents rotate through the PICU at our teaching institution staffed by university attending, fellow, and resident physicians. The PICU dietitian was responsible for education of residents regarding the quality initiative upon commencement of their PICU rotation.

Implementation

The standard approach regarding recommendation of PN initiation for PICU admits on day five began third quarter 2016. The PICU dietitian and pharmacist were present for multidisciplinary rounds to make consistent recommendations regarding PN initiation. The PICU dietitian written note within the electronic medical record was updated to reflect the decision to initiate PN later than the historical PICU practice of early PN initiation. Follow up and discussion occurred between the PICU dietitian and attending when deviations to the standard approach occurred.

Outcomes

Our primary outcome measure was percentage of PICU admissions with PN initiation within the first 4 days of admission. The secondary outcome was percentage of PICU admissions with up to 3 days of PN.

The primary balancing measures were PICU days and hospital length of stay for all PICU admissions. These outcomes were calculated for all included PICU admissions as well as for PICU admissions receiving PN. Data were examined after six months and then after an additional year. Feedback was provided to dietitians, pharmacists and clinicians.

Analysis

We followed our primary and secondary measures on

Table 1. Patient Characteristics.

	Early PN (pre-intervention) (n=2333)	Delayed PN (post-intervention) (n=2491)	p-value
Age: years, median (IQR)	3 (0,11)	3 (1,12)	0.006
Sex: Male, n (%)	1287 (55%)	1417 (57%)	0.23
PN = parenteral nutrition			

Table 2. Patient Outcomes.			
	Early PN (pre-intervention) (n=2333)	**Delayed PN (post-intervention) (n=2491)**	**p-value**
PN started before day 5, n (%)	128 (5.5%)	77 (3.1%)	<0.001
PN duration ≤ 3 days, n (%)	60 (2.6%)	38 (1.5%)	0.01
Balance measures			
All patients			
PICU LOS, days, median (IQR)	2(2,4)	2(2,4)	0.06
Hospital LOS, days, median (IQR)	4 (2,8)	4 (2,7)	0.004
Patients receiving PN			
PICU LOS, days, median (IQR)	7 (3,12.75)	6 (2,13)	0.32
Hospital LOS, days, median (IQR)	18 (9,28.25)	18 (10.25,30)	0.26
PN: parenteral nutrition; LOS: length of stay; PICU: Pediatric intensive care unit			

statistical process control (SPC) charts created using QI Macros 2017.05 (KnowWare International Inc, Denver, CO). We plotted the outcome on the vertical axis and time on the horizontal axis. Each data point represents one month of data. Charts were annotated with interventions. Separate centerlines were calculated for the baseline time period and the intervention period.

Patient characteristics, outcomes measures and balancing measures between the baseline and intervention periods were compared using Fisher's exact test for categorical variables and Mann Whitney U for continuous variables. All analyses were performed in R version 3.3.1 (R Foundation for Statistical Computing, Vienna, Austria).

Ethics

The Investigational Review Board approved this quality improvement project.

RESULTS

Patient characteristics of the early PN group, January 1, 2015-June 30, 2016, and the post-intervention group designated as delayed PN group, July 1, 2016-December 31, 2017, are contained in Table 1. A total of 2333 patients were identified in the early PN group and a total of 2491 patients in the delayed PN group. The percentage of patients receiving PN within the first four days of hospitalization was 5.5% in the early PN group versus 3.1% in the delayed PN group (p<0.001). (Figure 1) The percentage of patients receiving three days or less of PN decreased from 2.6% of patients to 1.5% (p=0.01). (Figure 2) For the subset of patients who were initiated on PN after admission to the PICU, median PICU length of stay was 7 days versus 6 days in the early PN group versus delayed PN group (p=0.32). Hospital length of stay for patients receiving PN was 18 days in the pre-intervention group and 18 days in the delayed PN group (p=0.26). (Table 2)

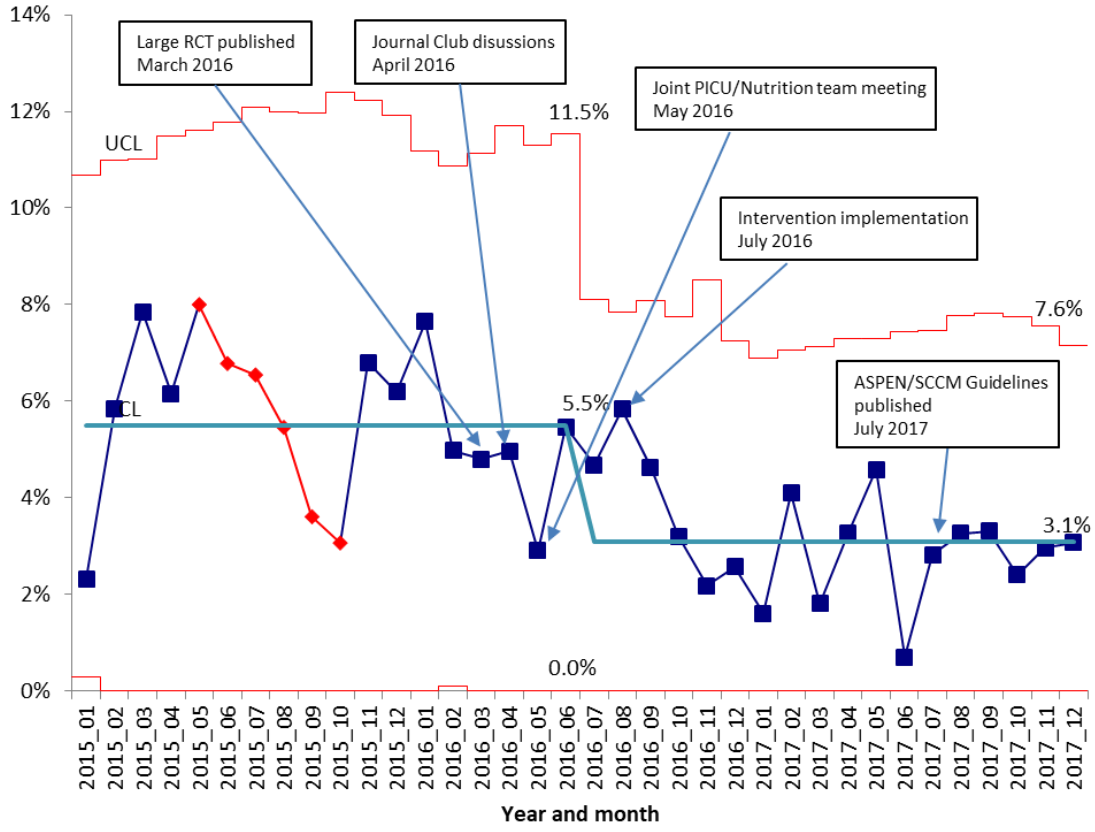

Figure 1. Percentage of patients with parenteral nutrition initiation prior to day five from PICU admit.
PICU: pediatric intensive care unit; UCL: upper control limit

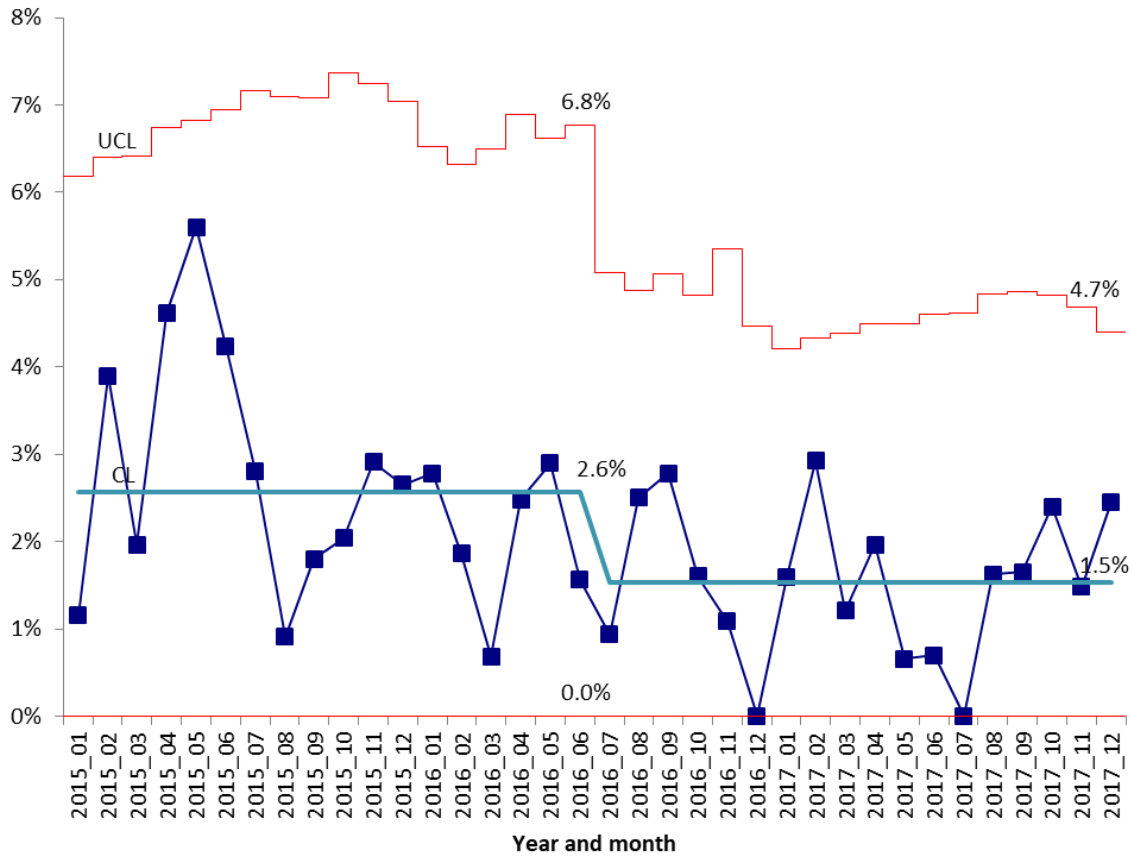

Figure 2. Percentage of PICU patients receiving parenteral nutrition for three days or less.
UCL: upper control limit

DISCUSSION

The rate of PN initiation during the first four days from PICU admit decreased nearly 50% following implementation of our quality initiative. The percentage of patients receiving short term PN, defined as three days or less, likewise decreased after the implementation. Overall the pre and post intervention groups had comparable lengths of stay. Of particular interest there were similar lengths of stay when comparing only those patients who received PN during their stay, supporting the safety of the practice change. The success of this quality initiative was highly dependent upon culture change through collaboration, rather than policy making and enforcement.

In addition to measuring the compliance of the initiative, one objective of the analysis was to evaluate the safety and efficacy of the initiative. A concern expressed by some prior to starting our initiative was that those patients receiving later PN would have a negative outcome. The RCT saw a shorter length of stay for the patient population randomized to the late PN initiation group, although the majority of the late group never even received PN because they succeeded in reaching enteral goals prior the late initiation time point. Therefore the concern was that although an overall benefit to the late PN initiation group was seen in the RCT, the patients eventually needing PN might be adversely effected. In the analysis of our quality initiative we therefore focused on comparison of length of stay only in patients receiving PN, rather than the whole PICU population. Examining only those who received PN removed the hypothesized benefit that better outcomes in a delayed PN group are related to the portion of that population that were not initiated on PN. The median length of stay for those patients who received PN was similar pre and post intervention, supporting safety of the initiative relative to the length of stay outcome.

Despite the results of the RCT, debate continues over the appropriate time to initiate PN in the critically ill child, as evidenced by the recommendations released from the American Society for Parenteral and Enteral Nutrition and the Society of Critical Care Medicine the year after the primary literature publication.[6] These recommendations acknowledge the study results to begin PN after seven days, but counter with expert opinion the option to begin PN 24 hours after PICU admission. Thus, current guideline recommendations lack focused specificity for standard provision of care regarding PN initiation.[7] The broad national debate over appropriate PN initiation, reflects the range of opinions expressed at our facility during our initial consensus discussions. Our quality initiative began shortly after the RCT but prior to the national guideline recommendations. In an effort to provide standard care, follow published evidence and bridge competing stakeholder viewpoints, our group opted to move forward with a standard of PN initiation in patients not reaching sufficient caloric intake by day five from PICU admit. Further analysis of the original study continue to support a delayed implantation of supplemental PN.[8-10]

Applying an evidence based approach to standardize care through a quality initiative can be difficult when national consensus is varied. Keeping our primary aim in focus during weekly nutrition support meetings and supporting the key drivers of education and continued multidisciplinary collaborative discussions, led to practice change. There was statistically significant movement toward decreasing PN initiation within the first five days of PICU within our institution. Likewise, there was a decrease in the percent of patients who were initiated on PN and then only received the product for less than or equal to three days.

There is opportunity for continued improvement, as evidenced by the analysis of our quality initiative data. Although statistically significant reductions were seen in the percentage of patients initiating PN prior to PICU day five, there are still on average four percent of our patients received an earlier PN initiation than our quality initiative standard. When following up with teams on why they initiated early, a common response was that the team anticipated the patient would need PN support for an extended period of time, therefore the team did not see benefit in waiting. Yet, of those patients initiated on PN prior to PICU day five, a portion received PN three days or less. The follow up analysis of the quality initiative provides relevant information for continued discussions surrounding the provision of quality standard care as related to PN initiation. Further progress toward achieving the quality measure of PN initiation on day five could be made through formation of formal policy.

A barrier to quality initiatives to improve evidence based care is overcoming existing culture. Generally, improvement efforts concisely identify an aim, key drivers, and interventions that focus on influencing the existing practice culture to realign within a new paradigm. Examination of the quality initiative reported herein is instructive, as it was based primarily on review of primary literature, open discussion, consistent recommendation and ongoing education rather than strict policy and subsequent enforcement. Whether it be through policy and enforcement or education and recommendation the goal of any initiative is to provide consistent high quality care that is sustainable. Sustainability is often achieved through cultural change. Once culture has changed, practice change has a greater probability of continuing beyond the intensive implementation phase. Limitations of the study include the retrospective analysis at a single center and lack of analysis within specific disease state patient populations.

CONCLUSIONS

Standardizing the recommendation and approach to PN initiation after evaluation of a large published RCT decreased early and overall PN use within our PICU. Discussion, consensus gathering and consistent recommendations proved effective in the quality initiative. Evaluation of this project demonstrate that influencing change through light touch techniques can be effective, especially in cases where firm national professional organization guidance is not available due to varying stakeholder opinions. Safety, as related to length of stay evaluation, was also demonstrated through the quality initiative evaluation.

CONFLICT OF INTEREST

The authors have no financial relationships relevant to this article to disclose.

FUNDING

The authors have no conflicts of interest to disclose.

References

1. Casaer M, Mesotten D, Hermans G, Wouters PJ, Schetz M, Meyfroidt G, Van Cromphaut S, Ingels C, Meersseman P, Muller J, Vlasselaers D, Debaveye Y, Desmet L, Dubois J, Van Assche A, Vanderheyden S, Wilmer A, Van den Berghe G. Early versus late parenteral nutrition in critically ill adults. N Engl J Med. 2011;365(6):506-517. https://doi.org/10.1056/NEJMoa1102662
2. McClave SA, Taylor BE, Martindale RG, Warren MM, Johnson DR5, Braunschweig C, McCarthy MS, Davanos E, Rice TW, Cresci GA, Gervasio JM, Sacks GS, Roberts PR, Compher C; Society of Critical Care Medicine; American Society for Parenteral and Enteral Nutrition. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). JPEN J Parenter Enteral Nutr. 2016;40(2):159-211. https://doi.org/10.1177/0148607115621863
3. Fivez T, Kerklaan D, Mesotten D, Verbruggen S, Wouters PJ, Vanhorebeek I, Debaveye Y, Vlasselaers D, Desmet L, Casaer MP, Garcia Guerra G, Hanot J, Joffe A, Tibboel D, Joosten K, Van den Berghe G. Early versus late parenteral nutrition in critically ill children. N Engl J Med. 2016;374(12):1111-1122. https://doi.org/10.1056/NEJMoa1514762
4. Li Y, Huang Y. Early versus late parenteral nutrition in critically ill children. N Engl J Med. 2016;375(4):384-385. https://doi.org/10.1056/NEJMc1605395
5. Mehta N, Parenteral Nutrition in Critcally Ill Children. N Engl J Med. 2016;374(12):1190-1192. https://doi.org/10.1056/NEJMe1601140
6. Mehta N, Skillman H, Irving S, Coss-Bu JA, Vermilyea S, Farrington EA, McKeever L, Hall AM, Goday PS, Braunschweig C. Guidelines for the provision and assessment of nutrition support therapy in the pediatric critically ill patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. JPEN J Parenter Enteral Nutr. 2017;41(5):706-742. https://doi.org/10.1177/0148607117711387
7. Jiminez L, Mehta N, Duggan C. Timing of the initation of parenteral nutrition in critically ill children. Curr Opin Clin Nutr Metab Care. 2017;20(3):227-231. https://doi.org/10.1097/MCO.0000000000000369
8. Vanhorebeek I, Verbruggen S, Casaer M, Gunst J, Wouters PJ, Hanot J, Guerra GG, Vlasselaers D, Joosten K, Van den Berghe G. Effect of early supplemental parenteral nutrition in the paediatric ICU: a preplanned observational study of

post-randomisation treatments in the PEPaNIC trial. Lancet Respir Med 2017;5:475-483. https://doi.org/10.1016/S2213-2600(17)30186-8

9. Puffelen E, Vanhorebeek I, Joosten K, Wouters PJ, Van den Berghe G, Verbruggen SC.Early versus late parenteral nutrition in critically ill, term neonates: a preplanned secondary subgroup analysis of the PEPaNIC multicenter, randomized controlled trial. Lancet Child Adolesc Health. 2018;2(7):505-515. https://doi.org/10.1016/S2352-4642(18)30131-7
10. Verstraete S, Verbruggen S, Hordijk J, Vanhorebeek I, Dulfer K, Güiza F, van Puffelen E, Jacobs A, Leys S, Durt A, Van Cleemput H, Eveleens RD, Garcia Guerra G, Wouters PJ, Joosten KF, Van den Berghe G. Long-term developmental effects of withholding parenteral nutrition for 1 week in the paediatric intensive care unit: a 2-year follow-up of the PEPaNIC international, randomized, controlled trial. Lancet Respir Med. 2019;7(2):141-153. https://doi.org/10.1016/S2213-2600(18)30334-5

Nørgaard JD, Sporrong SK. Views on the role of community pharmacy in local communities: a case study of stakeholders' attitudes. Pharmacy Practice 2019 Apr-Jun;17(2):1419.
https://doi.org/10.18549/PharmPract.2019.2.1419

Original Research

Views on the role of community pharmacy in local communities: a case study of stakeholders' attitudes

Josefine D. NØRGAARD, Sofia K. SPORRONG.
Received (first version): 28-Nov-2018 Accepted: 8-Apr-2019 Published online: 1-Jun-2019

Abstract

Objectives: To investigate the view of the role of community pharmacy by selected stakeholders in local Danish communities.
Methods: A mixed method approach combining qualitative and quantitative methods was used: observations at pharmacies, questionnaires for pharmacy staff and customers, and interviews with pharmacy owners, general practitioners (GPs) and politicians. Role theory was the theoretical foundation. Data was analyzed using directed content analysis and descriptive statistics.
Results: Five Danish towns were visited, resulting in five pharmacist interviews, 48 questionnaire replies from pharmacy staff, 59 customer interviews, three GP interviews and four interviews with local politicians. All stakeholders found the pharmacy to have a medical focus, although to a differing degree. While pharmacy staff and GPs had the greatest knowledge and expectations regarding the pharmacy staff's level of medical knowledge, local politicians had the least. Pharmacy staff wanted to take on more responsibility. Customers generally considered the pharmacy part of the healthcare sector with a high level of knowledge on medications. GPs' attitudes appeared to be related to the amount of communication between GP office and pharmacy. Local politicians interviewed did not seem to be aware of the competencies within the pharmacy, but once informed were open to using the pharmacy as an integrated part of the local healthcare system.
Conclusions: There was general consensus between stakeholder groups that medicine is the main area of focus at the pharmacy. However, investigated stakeholders did not appear to be aware of the full extent of the competencies within the pharmacy, and there was a general lack of consensus about the services the pharmacy should perform. If the competencies within the pharmacy are to be fully utilized, the pharmacy must not only tell but also show the local community what they can do.

Keywords

Community Pharmacy Services; Pharmacies; Pharmacists; Stakeholder Participation; Patients; General Practitioners; Attitude; Health Services Research; Surveys and Questionnaires; Qualitative Research; Denmark

INTRODUCTION

The profession of community pharmacy has undergone a paradigm shift from focus on the manufacturing of medicines to being a place for distribution and counseling.[1,2] For example in the form of health-related services, such as the Danish inhalation check service. Many studies have sought to explore the current role of the community pharmacist.[3-11] Thus the views of pharmacists, customers and general practitioners (GPs) on the role of pharmacists have been described in the international literature.

Overall, literature depicts two main views on pharmacists by pharmacy customers: the role of the pharmacist as an important stakeholder in healthcare, and the role of the pharmacist as a store employee.[8,12] These are also the two views presented by politicians.[13,14] Jose *et al*. and Kelly *et al*. found that customers consider pharmacists to be healthcare professionals at the same level as GPs.[6,7] Jose et al further found that 80% of customers considered pharmacists to be experts on medicines.[7] A Danish study has shown a correlation between the provision of health-related services and an increased view of pharmacists as healthcare professionals.[15]

Pharmacists see themselves as having many different identities, but they consider their main role to be that of medicines experts with tasks involving distribution, counseling and checking for medication errors.[4,5,16] Other studies have further found that there is a lack of consensus regarding the expectations about pharmacist competencies, with pharmacists valuing their competencies higher than other stakeholder groups.[3,17]

Studies have shown that GPs generally appreciate pharmacists' medical knowledge and their aid in prescription and interaction control.[3,18] Bidwell and Thompson found that GPs appreciate being contacted by pharmacists regarding potential medical problems, and that a personal relationship is important as part of the impetus to enter into professional collaboration.[18]

While many studies have focused on the role of the pharmacist, few if any studies have focused on the role of the pharmacy organization as a whole in a local community.

The Danish pharmacy system

Only pharmacists are allowed to own pharmacies in Denmark, and then only one main pharmacy, but up to eight other pharmacy departments in a radius of 80 km of the main pharmacy.

Danish pharmacies have two main types of staff. Pharmacists, with a five-year university degree and pharmaconomists (Danish pharmacy technicians with a three-year education) and students of both educations. These types of staff will henceforth be referred to as pharmacy staff.

Josefine D. S. V NØRGAARD. MsPharm. Department of Pharmacy, University of Copenhagen, Copenhagen (Denmark). josefine.noergaard@gmail.com
Sofia Kälvemark SPORRONG. PhD. Associate Professor. Department of Pharmacy, University of Copenhagen, Copenhagen (Denmark). sofia.sporrong@sund.ku.dk

Table 1. Methods and themes used for each stakeholder group

Stakeholder group	Customers	Pharmacy	GPs	Politicians
Method used	Structured interviews, including both closed and open-ended questions,	Questionnaire sent to all pharmacy staff + semi-structured interview with pharmacist or pharmacy owner	Semi-structured interview	Semi-structured interview
Method development *	Literature search + then matching with other stakeholder groups + two rounds of pilot studies	Questionnaire: literature search + two rounds of pilot studies Interview: Literature search + theme matching with questionnaire	Literature search + theme matching with other stakeholder groups	Literature search + theme matching with other stakeholder groups
Pilot study 1	Two test persons. Questionnaire used as structured interview guide	Four pharmacy employees used as test persons. Questionnaire used as an interview guide	NA	NA
Pilot study 2	Two test persons. Questionnaire used as structured interview guide	Response from five pharmacy employees, questionnaire sent out electronically	NA	NA
Themes	Expectations of the pharmacy, factors affecting choice of pharmacy, view on the pharmacy, view on potential pharmacy services	Questionnaire: View on the pharmacy, competencies and duties at the counter, the ideal pharmacy Interview: role of the pharmacy in society, view of the pharmacy by society, collaboration with surrounding health care sector, the ideal pharmacy	Relationship to the pharmacy, competencies of the pharmacy, possible increased use of pharmacy in society	Role of the pharmacy in the community, competencies of the pharmacy, use of pharmacy by the county, role of the pharmacy in an ideal world

* Theme matching means that themes were compared across stakeholders to ensure data would be comparable between stakeholder groups.

The Danish community pharmacy sector has undergone many changes, with focus on liberalization in the past few decades.[19] Services such as dispensing prescriptions, once the sole task of pharmacists, are now a shared responsibility between pharmacists and pharmaconomists. While services that used to be reserved for the pharmacy are now slowly being shared with other actors such as retail stores.[19] This is the case for some over-the-counter products and veterinary products. The most recent changes are 1) the introduction of 'medicine conversations', a health service giving newly diagnosed chronic patients the right to a conversation with a pharmacist regarding their concerns about their new treatment, 2) the introduction of increased competition within the pharmacy sector and 3) the introduction of limited prescribing rights for pharmacists.

The Association of Danish Pharmacies has a vision of Danish community pharmacy staff as the medicine experts of society, the experts who ensure health and optimal use of medicines.[20] The views on the current role of Danish pharmacies could provide points of action for achieving this role. Thus, the aim of this study was to investigate the view of the role of the local community pharmacy by pharmacy staff, pharmacy customers, local GP's and local politicians.

Theory

Role theory was used as the theoretical foundation for this research. According to Biddle and Thomas, the role of an organization is determined by the opinions and roles of stakeholders relevant to the organization. The role of an organization, is hence determined by social norms, demands and rules: roles are not only defined by the individual but also by other actors and the interactions between them.[21] To investigate the role of the pharmacy as an organization, according to Role theory, one must acknowledge the impact of other stakeholders. The model by Guirguis and Chewning regards the impact of interaction between individuals and their expectations about the interactions on role perception.[22] This model also shows that the role of an organization is dependent on the people in contact with the organization. The model by Sabater-Galindo et al regards factors relevant to the perceived pharmacist image.[23] The models presented by Guirguis and Chewning as well as Sabater-Galindo *et al*. were used to create questionnaires and interview guides that would aid in illuminating the role understanding of the pharmacy by different stakeholder groups.[22,23]

METHODS

Study design

The study was designed as a descriptive case study, based on a mixed method approach involving the following methods: interviews, questionnaires and observational studies. Five small towns were chosen to act as cases. The choice of small towns as cases was made due to the closer proximity between the chosen stakeholders and pharmacies than in large urban areas with several pharmacies and GP practices (see inclusion criteria further down). It was assumed that stakeholders in small towns would be more likely to have a personal relationship with their pharmacy and a deeper understanding of the competencies within the pharmacy, than if the study had been conducted in a big city. The towns were chosen to represent different parts of Denmark in order to get a diverse sample, and by the following criteria: the town had to have less than 10.000 citizens, be more than 30 km to the nearest big city (Odense, Aarhus, Aalborg, Copenhagen) and have only one pharmacy in the town.

Four stakeholder groups were chosen for this study. They were chosen since they were considered the stakeholders

with most power in determining the role of community pharmacy in small towns. The stakeholders chosen were:

- pharmacy staff, ie. pharmacists and pharmaconomists
- pharmacy customers
- GPs and
- local politicians

Pharmacy staff was for the sake of this study considered a homogenous group. Danish pharmaconomists have a high level of pharmacological expertise and both groups are counselling customers at the counter, with customers rarely knowing the difference between them. This was also limiting possible confusion when discussing competencies within the pharmacy with the other stakeholders.

Local politicians were included in this study since they have the power to e.g. involve pharmacy staff in the education of local health personnel and medicine management in retirement homes.

Table 1 shows the data collection methods used for the stakeholders, how questions were developed, and pilot tests.

Participant recruitment and data collection

Between three and five days were spent in each small town, with the first author visiting the pharmacy for two to three days and seeing politicians and GPs on the other days.

Pharmacy staff: Pharmacies were contacted by email and a follow up phone-call was made approximately one week after the email was sent. A total of six small town pharmacies were contacted about participating in the research project. One declined due to lack of time, leaving a total of five visited pharmacies. Questionnaires were sent out electronically and pharmacy staff was asked to answer the questionnaire before the pharmacy visit. When at the pharmacy, the researcher spent time observing everyday interactions with customers at the counter (results not shown), talking to pharmacy staff, and interviewing a leading pharmacist or pharmacy owner. Pharmacist interviews were conducted when time opened up at the counter and lasted between fifteen and forty minutes.

Pharmacy customers: Customers were recruited for participation at the counter by pharmacy staff at each pharmacy. A note describing the study was placed at each counter and pharmacy staff was instructed to ask all customers if they would be interested in participating (consecutive sampling). The interview then took place either at a far end of the counter or in a separate room at the pharmacy. At least one day was spent interviewing customers at each pharmacy.

General practitioners: There was only one GP clinic in each city. GPs in each town were contacted via telephone to explain the project and a follow-up email was sent with a more in-depth description of the study. The interview guide for GP interviews was created with the intention that the interview would last ten minutes, corresponding to an appointment with a patient. This was to aid recruitment. Interviews took place at the GPs' offices in order to make it more convenient for them to participate. Interviews with GPs took between six and seventeen minutes.

Local politicians: Two local politicians from each town were contacted, one from each political wing. Politicians were chosen on the basis of the criteria that they were currently members of the town council and lived in the town of the pharmacy visited. The focus on a local connection to the pharmacy was valued as more important for the research than in-depth knowledge of the health policies of the municipality, thus interviewed politicians did not necessarily have health as their main area of focus in their political work. Interviews took place at a location of the interviewee's choice. Interviews lasted between fourteen and forty-five minutes.

Methods of analysis

All interviews were recorded and transcribed, except for two customer interviews where customers were not comfortable with recording. In these cases, answers were noted by hand. All data were analysed using directed content analysis, where themes and coding schemes for analysis are decided on the base of existing literature.[24]

Quantitative data from interviews and questionnaires was analysed using descriptive statistics.

Ethics

According to Danish regulations, ethical approval was not required. However, ethical considerations were met. Measures were taken to safeguard participants' confidentiality. All participants gave informed consent.

RESULTS

Data were collected from five towns (A-E) geographically spread out in Denmark. Table 2 gives an overview of the number of respondents in each town and per stakeholder group.

All stakeholders will hereafter be designated according to the town they come from: stakeholders in town B, pharmacy B, GP B, politician B, etc. Two politicians were interviewed in town D, and they are designated politicians D1 and D2.

Views on the role of the pharmacy were similar within all stakeholder groups from the five towns, and different

Table 2. Overview of amount of data collected during the study. More than one pharmacy department was visited for pharmacies B and C.

Town	Customer interview	Pharmacy questionnaire (responses)	Pharmacy interview	GP Interview	Politician interview
A	10	10	Pharmacist	0	1
B	8	5	Pharmacy owner	1	1
C	19	8	Pharmacist	1	0
D	12	14	Pharmacy owner	0	2
E	10	11	Pharmacy owner	1	0

Table 3. The views of different stakeholder groups on the investigated questions

	Customers	Pharmacy	GPs	Politicians	General view
Role of the pharmacy	NA	Drug distributors and counsellors	Distribution center and to some extent a health professional collaborator	Creates a sense of safety in society. Distribution and counseling on drugs	Distribution and counseling on drugs
Collaboration with GPs	Expected to a high degree	Primarily good	Primarily good	NA	Good collaboration with GPs
Business vs healthcare	Both	More healthcare than business	More healthcare than business	More business than healthcare	Both, but emphasis on healthcare
Competencies of the pharmacy	Good medical knowledge but less knowledgeable than the GP	High medical and health-related knowledge	Safety net for prescription 'errors' and interactions, and competent counsellors → good medical knowledge	Specialized medical knowledge	Good medical knowledge
The future pharmacy	Divided in willingness with regard to an expanded pharmacy role	More focus on drugs and becoming an integrated part of the healthcare system	Open towards more collaboration	The same as today, but open to more collaboration	NA

between stakeholder groups. It can generally be stated that stakeholder groups with more contact with the pharmacy had a deeper level of understanding of the competencies within the pharmacy, and thus higher expectations about the role and services of the pharmacy. The range extended from pharmacy staff with the highest expectations to GPs to customers to local politicians. The overall results of this study can be summed up as shown in Table 3.

General overview

Except town A, all towns were affected by urbanisation, with empty and dilapidated houses, and the closing of many stores in the towns during the last couple of years. Towns A and E were tourist towns, so they had more town life than the other three. Pharmacies B, C, and D were country pharmacies and thus had bigger veterinary departments than the other pharmacies. Pharmacy B was located in an area where a relatively big part of the citizens was living in social housing situations, hence dose-dispensed medication was a big part of their turnover.

The majority of customers interviewed were female (70-83%), locals (75-100%) and retired or receiving social help for example in the form of sick leave (50-88%). Between 75 and 95 % of customers took medications on a regular basis and between 75 and 92 % always used the same pharmacy.

The views of pharmacy customers

Customers across towns agreed that the pharmacy was part of the healthcare sector. Most customers also acknowledged the pharmacy as a private business, although some expressed the concern that economic factors might weigh more in the minds of pharmacy staff than benefits to the customer. Pharmacy staff were highly acknowledged as experts in medicine, but for the most part not considered to be health professionals at the same level as GPs. Approximately half of customers in towns A-C considered pharmacy staff to be health professionals at the same level of GPs, while in town D this was one third and in town E 80 percent. This difference in views was also reflected in the willingness to let pharmacy staff access medical files: whereas most customers (90 percent) in town E thought this would be a good idea, town A followed with 70 percent of customers, and towns B-D with 50 percent.

In general, customers would not accept pharmacy services that required a deeper level of medical knowledge and understanding, such as medicine conversations and vaccinations, but would accept services that did not require this, such as advice on health improvement without the use of drugs or advice on minor ailments. The clear outlier here was pharmacy E, whose customers were keen on accepting all types of health services, even those requiring a deeper medical understanding. Customers were asked about their expectations of the pharmacy on a five-point Likert scale. Results are shown in Table 4. Services shown in italics refer to a standard deviation above 1, indicating a lack of complete consensus on the expectancy about the service.

Table 4. Customer expectations about the pharmacy. On a 5-point Likert scale, customers were asked about the degree to which they expected certain services. Services generally expected are defined as being 4 or above on the Likert scale, while services generally not expected are defined as being below 4 on the Likert scale. Services marked in italics had a standard deviation above 1.

Services generally expected	Services not generally expected
● The pharmacy is easily accessible, I can always enter and expect them to take the time to answer my questions ● *The pharmacy collaborates with my GP* ● The pharmacy can tell me how to take my medication ● The pharmacy can tell me how to store my medication ● *The pharmacy can tell me about side effects* ● *The pharmacy can help me regarding the use of my medical devices* ● The pharmacy can advise me on the use of my OTC drugs ● *The pharmacy can advise me on creams*	● *The pharmacy can help me understand my medical treatment* ● *The pharmacy can tell me what to do if I forget to take my medication* ● *The pharmacy can answer questions about my disease* ● *The pharmacy can tell me how to handle side effects* ● *The pharmacy can keep track of drug-drug interactions* ● *The pharmacy can advise me on natural remedies*

Table 5. Counter-related services. Pharmacy staff were asked to rate themselves on a 5-point Likert scale with regard to the following 12 counter-related services, the degree to which they 1) considered themselves competent to offer the service, 2) whether the service was their professional obligation to perform and 3) the degree to which they performed the service in daily practice. The total mean scores are shown in parentheses.

Explaining how the medication works (4.33, 4.52, 3.92)	Counseling on OTC drugs (4.66, 4.77, 4.64)
Counseling on side effects (4.10, 4.33, 3.65)	Counseling on creams (4.19, 4.09, 4.11)
Checking for drug-drug interactions (4.38, 4.50, 3.81)	Checking for right drug in right amount (4.67, 4.83, 4.68)
Counseling on food-drug interactions (3.98, 4.42, 3.58)	Advising about correct use (4.69, 4.83, 4.58)
Explaining about legal matters such as reimbursement (4.66, 4.62, 4.45)	Uncovering wrongful use (4.13, 4.65, 4.02)
Counseling on supplements (3.85, 3.94, 3.64)	Helping customers who used to take their medication incorrectly to use it correctly and understand why it is important to do so (4.54, 4.88, 4.42)

The views of pharmacy staff

> "Our role is to make sure customers get the best possible treatment with their drugs, where we want to ensure that they understand how to take them". Pharmacist E

The above quote shows the general role perception of the pharmacy staff in this study. They consider themselves to be medical experts who not only ensure that treatment is correct, but also that their customers understand the treatment.

All pharmacy staff identified themselves as being part of the healthcare system. They also acknowledged being a private business, but did not identify as sales personnel in a store. According to pharmacy staff, the most important tasks for a pharmacy are patient counseling, ensuring optimal use of medication and patient safety. This was also reflected in the services that occupied most of the personnel's time: dealing with customers and dispensing prescription medicines. Pharmacy staff was asked about a range of counter-related services to determine if they were considered services in which the pharmacy was competent and had a professional duty to perform, and if these services were performed. These services are shown in Table 5.

Pharmacy staff considered the majority of the services to be obligations at which they were competent, were obligated to perform and did perform. With the exception of pharmacy D, only the service of counseling on supplements rated below a 4 on the 5-point Likert scale on all three counts.

Pharmacy staff was asked what the pharmacy would be like in an ideal world. Answers revolved around a higher focus on drugs and better collaboration within the healthcare sector.

> "Well, I would like it if we could get money for distributing drugs, because that's not what we live from today. I would like it if we didn't have to focus so much on free trade goods, if we could be allowed some money for the time spent on counseling". Pharmacist C

> "A better link between all parties in the healthcare system. Well, it's kind of the pharmacies and the hospitals and the GPs [uses hands to indicate boxes]. It's not the healthcare sector; well it is, but it's kind of grouped". Pharmacist A

The views of General Practitioners

Three GPs were interviewed. Their degree of collaboration with the pharmacy ranged from no contact to daily contact. The primary reason for not participating was lack of time. Since the towns visited only had one GP clinic, there was no way of getting more GP's in the study.

As can be seen from Table 6, the higher the degree of collaboration between pharmacy and GP, the more positive the view of the GP about the competencies and future use of the pharmacy. All GPs viewed the knowledge and counseling of the pharmacy as beneficial to their patients, especially in situations such as OTC purchases where the GP was not involved. The view about the health services provided by the pharmacy was diverse, ranging from the attitude that the pharmacy should not provide health-related services, to the attitude that it would be of great help to the GP if the pharmacy was more involved.

The views of local politicians

The politicians interviewed were from different political parties ranging from mid left parties to mid right parties. None of the interviewed politicians had health as their primary focus in their political work. Politicians generally viewed the pharmacy as a private business. However, all acknowledged that the level of medical knowledge and service at the pharmacy was unique for a business. Politicians viewed the pharmacy as having a role in the making and shaping of communities, providing a sense of

Table 6. Views of GPs on pharmacies and pharmacy competencies.

	GP B (no collaboration)	GP E (good collaboration)	GP C (high degree of collaboration)
Role of the pharmacy	Private business, a distribution center	A professional healthcare collaborator	A distribution center and professional healthcare collaborator
Competencies of pharmacy personnel	Basic counseling and checking for obvious interactions	Safety net regarding side effects, dose, and interactions	In-depth knowledge on medication and side effects, beneficial to both patient and GP
Attitudes towards pharmacy- provided health services	The pharmacy should stick to distributing	Beneficial if GP receives information and is involved in what happens to the patient	Highly relevant and would be helpful to the GPs' workload
Where is the pharmacy essential	OTC counseling where the GP is not involved	Counseling on devices, OTC products and dietary supplements	NA

security for people to be able to get medication and counseling, and creating a customer base for other stores in the town.

At the end of most interviews, the politicians began interviewing the researcher about the competencies of pharmacy staff and projects occurring elsewhere in the country. When informed about the competencies that lie within the pharmacy and projects run in other municipalities, politicians were open to the idea of using the pharmacy as a more integrated part of the local healthcare system:

> "It's an untapped potential that could be incorporated in all of these things [services for chronic patients]". Politician B

> "Well, I think that if the pharmacy approaches us with something . . . and it's not too expensive, then I can't imagine we would say no". Politician D2

DISCUSSION

All stakeholder groups, except for local politicians, viewed the pharmacy primarily as a part of the healthcare system. This indicates that stakeholders with close contact to the pharmacy acknowledge the professional knowledge within the pharmacy. This supports the theory proposed by the authors when creating this study, that closer proximity to the pharmacy increases the knowledge of the competencies. It is further interesting to note that the stakeholder group representing the law-making body, and thus the body with the greatest impact on the future role of the Danish pharmacy, which is highly regulated by law, had a different view on the fundamental role of the pharmacy than all other stakeholder groups. Further studies should be made to investigate if this view of the pharmacy as a private business is general to politicians at all levels, and all political parties. If so, pharmacy organizations should take public action to show politicians that they have a role in the healthcare system - if indeed this is a role they wish to have.

The results give a clear indication that although customers consider the pharmacy as part of the healthcare system, they lack a clear definition of what they can expect from their local pharmacy. Not only are many of the points on the 'services not generally expected' column services the pharmacy is indeed able to perform, but many of the services are shown in italics, indicating there is no clear perspective on the role and competencies of the pharmacy. This is in keeping with the views of one of the interviewed pharmacists, who stated that customers were not aware of the full scope of competencies within the pharmacy. This view of the lack of awareness of pharmacy competencies has also been shown by Saramunee and colleagues.[3] This study also pointed to uncertainty about pharmacy competencies, showing a lack of great interest in health-related services that would mark the pharmacy as a fully integrated part of the healthcare system. A similar trend has been shown in a study by Iversen and colleagues.[25]

Since pharmacy staff identifies themselves as medicine experts with a key role in counseling and distributing medicines, pharmacies should make an active effort to show customers the full scope of their competencies. This would encourage customers to see pharmacy staff in the role with which they identify.

This study indicates that the more collaboration between GP and pharmacy, the more positive is the attitude of the GP towards extended pharmacy services. In order to have GPs accept extended pharmacy health-related services, this study indicates that the pharmacy should:

- Establish (or build on the current) collaboration and personal relationship with GPs
- Ensure GP involvement in health-related services, and
- Ensure a proper registration system that enables GPs to keep track of the services provided to their patients at the pharmacy.

Few if any studies have investigated the view of local politicians about the use of the pharmacy.[13,14] This study therefore provides new knowledge on the view of community pharmacy in small towns in Denmark. Although politicians were not aware of the scope of competencies within the pharmacy, when they were informed about them, they were open to the idea of increased collaboration with the local pharmacy. Thus, if pharmacies want to have more responsibility in the local healthcare system, they should contact politicians about establishing such collaborations. This might be easier than most pharmacy staff thinks. Since, at least some, politicians already view the pharmacy as a key player in the making of the general community, one could assume that this, using the arguments of creating greater security, more health and more life in the city, would appeal to an already existing image in the politician mindset.

Although this study showed a high degree of similarities in views within stakeholder groups across towns, one town stood out. Pharmacy customers in town E were more likely to value pharmacy staff as health professionals at the level of GPs and were more comfortable allowing pharmacy staff access to medical files than customers at pharmacies in the other investigated towns. This view was also seen in the interview with GP E, who was keen to acknowledge the role of the pharmacy as a safety net for prescription control, interactions and OTC purchases. There were no obvious contextual factors in which pharmacy E differed from the other pharmacies. One possible explanation could however be that the pharmacy owner focused on healthcare and created a trusting environment where employees felt their role as healthcare staff was important. For example, the staff at pharmacy E's preferred method to update their knowledge was self-study, which allowed them to concentrate on the needs of customers rather than what might be a 'hot topic' for pharmacy staff in general. Since no one reason could be seen for the different view on pharmacy E was discovered, it is likely that it is due to a several of factors.

The results of this study show that communication between the pharmacy and stakeholder groups, as well as information on the competencies of the pharmacy, increase the view of pharmacy staff as healthcare professionals and the desire to use the pharmacy actively in

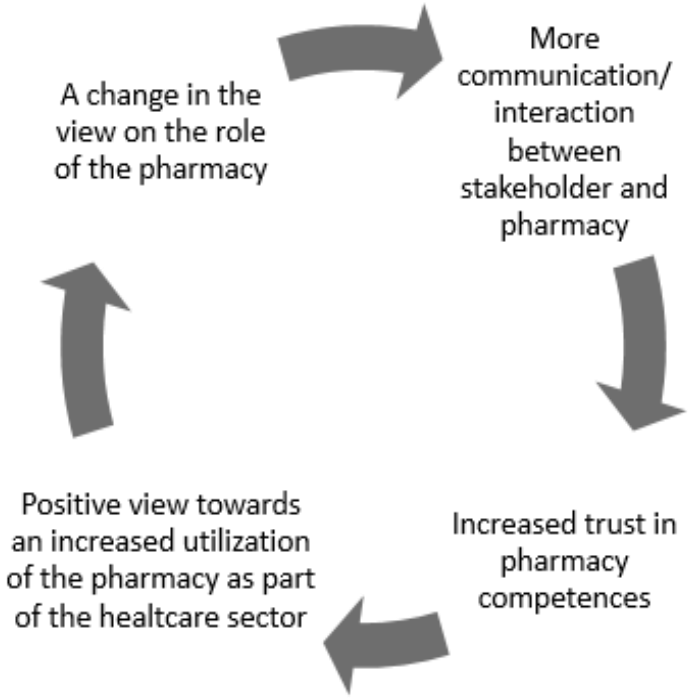

Figure 1. The role through interaction circle. Showing that roles change when interaction between stakeholders are increased. The circle could be said to be a reversed "care and respect circle" compared to the one presented by Schommer *et al.*[17]

local healthcare. The 'role through interaction circle' (Figure 1) shows the positive correlation between interactions and presenting pharmacy competencies and a change in view on the role of the pharmacy.

This fits well within the concepts of role theory. Guirguis and Chewning presented a model describing the four perspectives present in role theory: organizational, symbolic interactionistic, cognitive and functional.[22] The results from this study add a new factor to the cognitive and functional part: the views of others. According to the model by Guirguis and Chewning, pharmacist and patient expectations affect these two perspectives of role theory. Interviews with politicians conducted for this study made clear that information from an outsider about the abilities of the pharmacy can affect their views of e.g. politicians. Since politicians can also act as patients, it could be anticipated that this is true for all stakeholders. Thus, we suggest an addition to the model by Guirguis and Chewning, where the knowledge and expectations of others can affect the views and attitudes of pharmacists and pharmacy users (Figure 2).

If pharmacies want to achieve a more active role in their local healthcare systems, they should increase interaction with their local healthcare system, GPs and politicians, as well as increasing focus on presenting their competencies to their customers.

In order to achieve the role pharmacy staff wants for the pharmacy, they should focus on the following three things:

- Make customers aware of what they can expect
- Build a professional relationship with local GPs
- Build relations with local politicians

Role theory can help understand the role the pharmacy already possesses in the local environment and give a base for strategical entry points in obtaining a desirable role. By investigating the perceived role from a Role Theory perspective, and then using the interaction circle shown in Figure 1 as a practical tool, pharmacies can work towards the role they wish to have.

Limitations

The first author, who is a pharmacist, primarily designed and collected data for this study, which introduces the risk of bias. However, the second author is not a pharmacist and was involved in all parts of the study except data collection. Combined with the fact that the preparation, collection and analysis of data were inspired by and comparable with current literature, this means that the bias is not considered a great limitation. The small sample size for number of towns and number of stakeholders per town investigated is a limitation to the transferability of the study. More studies should be conducted involving different types of towns/pharmacies. However, this study can provide useful knowledge on subjects to investigate and methods to use if one wishes to perform a similar study in another setting. That customer interviews took place in the pharmacy, could be a limitation as customers might not feel comfortable expressive negative opinions on the pharmacy in this setting. The number of different stakeholder groups should also be considered a possible limitation to this study. There are many more stakeholders relevant for determining the role of the pharmacy than the ones investigated here, for instance veterinarians, media, citizens not using a pharmacy, nurses, other shop keepers etc. However, the stakeholders chosen for this study was

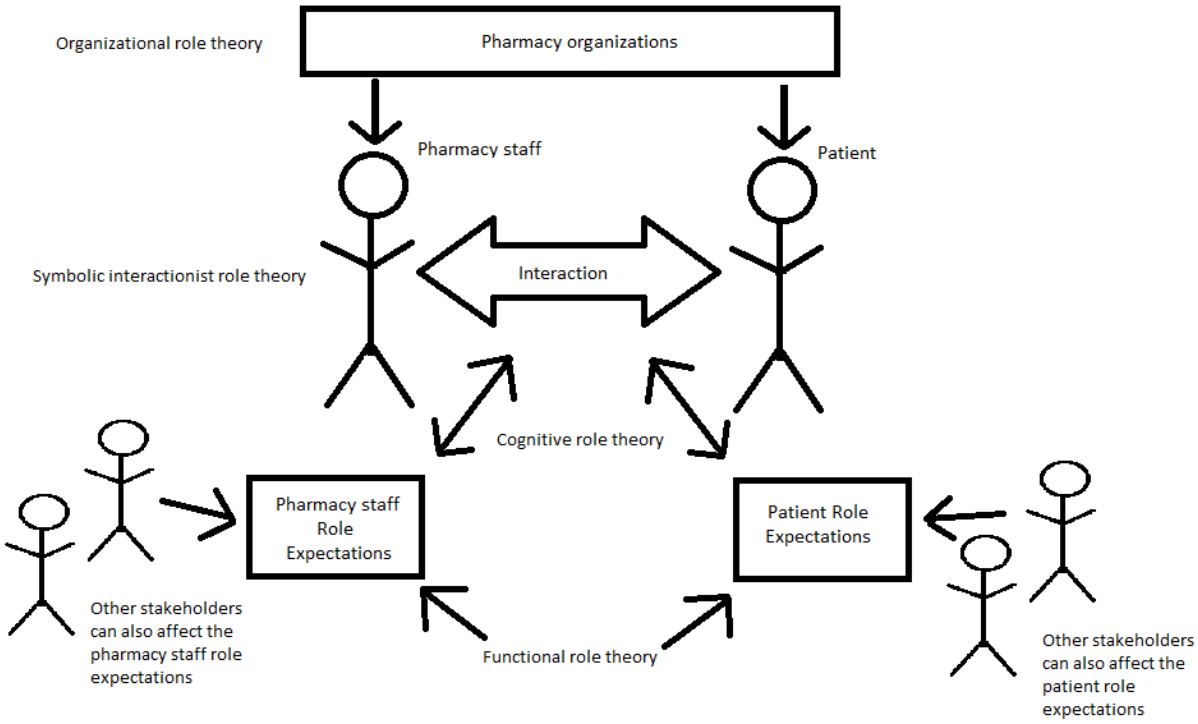

Figure 2. The four different perspectives in role theory and how they affect each other [22] with the addition of the effect of others' experiences with the pharmacy. This addition was based on the first authors experience during the politician interviews were attitudes towards the pharmacy was changed when informed of the competencies within the organization. The figure further deviated from the original by the change of "pharmacist" to "pharmacy staff".

considered as most powerful in regards to determining the role of the pharmacy, and thus it is fair to assume that the picture drawn is general.

CONCLUSIONS

There is general consensus between the investigated stakeholder groups that medicine is the main area of focus at the pharmacy. However, the investigated stakeholders did not appear to be aware of the full extent of competencies within the pharmacy, and there was a general lack of consensus on the services the pharmacy should perform and the role it should play in society. Thus, the community pharmacy does not have a clearly defined role in the local context. If the competencies within the pharmacy are to be fully utilized to create a more defined pharmacy role as the pharmacy staff in this study want, it is up to the pharmacy to tell as well as show their local community and relevant stakeholders what they can do. The perspective of Role Theory can be used better understand the processes underlying how pharmacies are viewed, also in relation to other actors.

ACKNOWLEDGEMENTS

The authors would like to thank all participants in this study.

CONFLICT OF INTEREST

The authors declare they have no conflicts of interest.

FUNDING

No specific founds were received for carrying out this study.

References

1. Claesson C. Apotekaryrke i förändring - En socialfarmaceutisk studie av apotekarnas yrkesutveckling och professionella status. [Change in the Pharmaceutical Profession. A Social Study of the Evolution of the Pharmaceutical Profession and the Professional Status of the Pharmacist]. Uppsala, Sweden: Uppsala Universitet; 1989.
2. Bissell P, Traulsen J. Sociology and Pharmacy Practice. London, UK: Pharmaceutical Press; 2005.
3. Saramunee K, Krska J, Mackridge A, Richards J, Suttajit S, Phillips-Howard P. How to enhance public health service utilization in community pharmacy?: general public and health providers' perspectives. Res Social Adm Pharm. 2014;10(2):272-284. https://doi.org/10.1016/j.sapharm.2012.05.006
4. Salim AM, Elgizoli B. Exploring self-perception of community pharmacists of their professional identity, capabilities, and role expansion. J Res Pharm Pract. 2016;5(2):116-120. https://doi.org/10.4103/2279-042X.179574
5. Elvey R, Hassell K, Hall J. Who do you think you are? Pharmacists' perceptions of their professional identity. Int J Pharm Pract. 2013;21(5):322-332. https://doi.org/10.1111/ijpp.12019

6. Kelly DV, Young S, Phillips L, Clark D. Patient attitudes regarding the role of the pharmacist and interest in expanded pharmacist services. Can Pharm J (Ott). 2014;147(4):239-247. https://doi.org/10.1177/1715163514535731
7. Jose J, Al Shukili MN, Jimmy B. Public's perception and satisfaction on the roles and services provided by pharmacists - Cross sectional survey in Sultanate of Oman. Saudi Pharm J. 2015;23(6):635-641. https://doi.org/10.1016/j.jsps.2015.02.003
8. Cavaco AM, Dias JP, Bates IP. Consumers' perceptions of community pharmacy in Portugal: a qualitative exploratory study. Pharm World Sci. 2005;27(1):54-60. https://doi.org/10.1007/s11096-004-2129-z
9. Kucukarslan S, Lai S, Dong Y, Al-Bassam N, Kim K. Physician beliefs and attitudes toward collaboration with community pharmacists. Res Social Adm Pharm. 2011;7(3):224-232. https://doi.org/10.1016/j.sapharm.2010.07.003
10. Kelly DV, Bishop L, Young S, Hawboldt J, Phillips L, Keough TM. Pharmacist and physician views on collaborative practice: Findings from the community pharmaceutical care project. Can Pharm J (Ott). 2013;146(4):218-226. https://doi.org/10.1177/1715163513492642
11. Nørgaard LS, Colberg L, Niemann MR. The role of the Danish community pharmacist: perceptions and future scenarios. Pharm World Sci. 2001;23(4):159-164.
12. Renberg T, Wichman Törnqvist K, Kälvemark Sporrong S, Kettis Lindblad A, Tully MP. Pharmacy users' expectations of pharmacy encounters: a Q-methodological study. Health Expect. 2011;14(4):361-373. https://doi.org/10.1111/j.1369-7625.2010.00643.x
13. Traulsen JM, Almarsdóttir AB. Pharmaceutical Policy and the Pharmacy Profession. Pharm World Sci. 2005;27(5):359-363. https://doi.org/10.1007/s11096-005-3798-y
14. Wisell K, Kälvemark Sporrong S. The Raison Dêtre for the Community Pharmacy and the Community Pharmacist in Sweden: A Qualitative Interview Study. Pharmacy (Basel). 2016;4(1):3. https://dx.doi.org/10.3390%2Fpharmacy4010003
15. Kaae S, Dam P, Rossing C. Evaluation of a pharmacy service helping patients to get a good start in taking their new medications for chronic diseases. Res Social Adm Pharm. 2016;12(3):486-495. https://doi.org/10.1016/j.sapharm.2015.08.002
16. Svensberg K, Kälvemark Sporrong S, Håkonsen H, Toverud EL. 'Because of the circumstances, we cannot develop our role': Norwegian community pharmacists' perceived responsibility in role development. Int J Pharm Pract. 2015;23(4):256-265. https://doi.org/10.1111/ijpp.12154
17. Schommer JC, Gaither CA. A segmentation analysis for pharmacists' and patients' views of pharmacists' roles. Res Social Adm Pharm. 2014;10(3):508-528. https://doi.org/10.1016/j.sapharm.2013.10.004
18. Bidwell S, Thompson L. GPs, community pharmacists and shifting professional boundaries. N Z Med J. 2015;128(1414):19-26.
19. Rapport om modernisering af apotekssektoren [Internet]: Ministeriet for sundhed og forebyggelse. [In Danish: Report on modernizing the pharmacy sector: Ministry of Health and Prevention] Available from: http://www.sum.dk/Aktuelt/Publikationer/~/media/Filer%20-%20Publikationer_i_pdf/2014/Rapport-om-modernisering-af-apoteker-juni-2014/Rapport_om_modernisering_af_apotekersektoren_juni_2014.ashx (accessed Nov 28, 2018).
20. Apoteket Tættere på dig - Strategi for apotekerne i Danmark Internet: Danmarks Apotekerforening. [In Danish: The pharmacy closer to you – Strategy for pharmacists in Denmark internet: The Association of Danish Pharmacies] Available from: http://www.apotekerforeningen.dk/om-apotekerne/~/media/Apotekerforeningen/publikationer/Strategibrochure%202016.ashx (accessed Nov 28, 2018).
21. Biddle BJ, Thomas EJ. Basic Concepts for Classifying the Phenomena of Role. In: Biddle BJ, Thomas EJ, eds. Role Theory: Concepts and Research. New York, NY: John Wiley & Sons; 1966.
22. Guirguis LM, Chewning BA. Role theory: literature review and implications for patient-pharmacist interactions. Res Social Adm Pharm. 2005;1(4):483-507. https://doi.org/10.1016/j.sapharm.2005.09.006
23. Sabater-Galindo M, Ruiz de Maya S, Benrimoj SI, Gastelurrutia MA, Martinez-Martinez F, Sabater-Hernandez D. Patients' expectations of the role of the community pharmacist: Development and testing of a conceptual model. Res Social Adm Pharm. 2017;13(2):313-320. https://doi.org/10.1016/j.sapharm.2016.04.001
24. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15(9):1277-1288. https://doi.org/10.1177/1049732305276687
25. Iversen L, Mollison J, MacLeod TN. Attitudes of the general public to the expanding role of community pharmacists: a pilot study. Fam Pract. 2001;18(5):534-536. https://doi.org/10.1093/fampra/18.5.534

Mishriky J, Stupans I, Chan V. An investigation of the views and practices of Australian community pharmacists on pain and fever management and clinical guidelines. Pharmacy Practice 2019 Apr-Jun;17(2):1436.
https://doi.org/10.18549/PharmPract.2019.2.1436

Original Research

An investigation of the views and practices of Australian community pharmacists on pain and fever management and clinical guidelines

John MISHRIKY, Ieva STUPANS, Vincent CHAN.
Received (first version): 20-Dec-2018 Accepted: 9-Jun-2019 Published online: 11-Jun-2019

Abstract

Background: Fever and pain are common conditions in the Australian healthcare setting. Whilst clinical guidelines provide important therapeutic recommendations, evidence suggests they are not always followed. Given that community pharmacy is one of the most frequently accessed primary healthcare services, it is important to understand the views and practices of community pharmacists in pain and fever.

Objectives: To investigate the views and practices of Australian community pharmacists in pain and fever management, and their views on relevant clinical guidelines.

Methods: A cross-sectional study of community pharmacists in Australia was conducted using a customised, anonymous, self-administered, online questionnaire between March and May 2018. To capture a broad range of demographics, pharmacists were recruited via local industry contacts and the Pharmaceutical Society newsletter, with further recruitment through snowball sampling. The main outcomes measured were pharmacists' views, practices and treatment recommendation of choice in pain and fever management, as well as views on clinical guidelines and training.

Results: A total of 113 pharmacists completed the survey. In general, paracetamol (72%) was preferred as a recommendation over ibuprofen, and was the drug of choice for most mild to moderate pain and fever scenarios. Majority of pharmacists reported good knowledge of pain and fever management, however, only approximately half reported recent pain management training. Greater than 87% of pharmacists believe that clinical guidelines are useful in fever management, and 79% of pharmacists believe that following clinical guidelines is important in pain management.

Conclusions: While most pharmacists recognise the importance of guidelines and demonstrated good pain and fever management, results suggests opportunities to promote additional education, upskilling, and research in this space to further optimise pain and fever management in the community.

Keywords

Pain; Fever; Pain Management; Acetaminophen; Ibuprofen; Pharmacies; Pharmacists; Choice Behavior; Professional Practice; Surveys and Questionnaires; Australia

INTRODUCTION

Australian community pharmacies are considered to be important sources of a wide range of healthcare services, and are regularly the first point of contact for most patients due to convenience, accessibility and availability of a plethora of medications at reasonable costs.[1-3]

Primary healthcare professionals require reliable and up-to-date evidence and clinical information (for example clinical guidelines) to assist in making the most appropriate and safest therapeutic decision for patients.[4,5] The importance of healthcare professionals appreciating and adhering to clinical guidelines is amplified particularly when patients present with symptoms that potentially warrant thorough medical analysis prior to initiating pharmacotherapy. Pharmacists should familiarise themselves with the medical recommendations adopted in Australian healthcare practices, given that community pharmacies are one of the most frequently and easily accessed primary healthcare services.

In Australia, it is well documented that pain and fever symptoms are common complaints expressed by patients of all age groups.[6-8] Failure to adequately manage pain and fever symptoms can have a significant impact on patient outcome and exacerbation of additional health consequences. Community pharmacists hold an advisory position and have an opportunity to effectively engage with patients and assess whether pharmacological management of pain and fever symptoms are appropriate and are attuned to the current clinical recommendations. For example, The National Institute for Health and Care Excellence (NICE) provides clinical guidelines to Australian healthcare practitioners and pharmacists on the diagnosis, assessment and treatment of feverish illness, for example using paracetamol or the Non-Steroidal Anti-Inflammatory drug (NSAID) ibuprofen; while the Australian Therapeutic Guidelines (TG) provides clinical guidelines on the general assessment and management of pain, including the 'Stepwise' approach adopted for pharmacological management of acute and chronic pain in Australia, such as using paracetamol, NSAIDs and/or opioids, depending on the nature of the pain.[9,10]

John MISHRIKY. BPharm(Hons). School of Health and Biomedical Sciences, Discipline of Pharmacy, RMIT University. Bundoora VIC, (Australia). john.mishriky@rmit.edu.au
Ieva STUPANS. BPharm, PhD. Professor and Discipline Head of Pharmacy. School of Health and Biomedical Sciences, Discipline of Pharmacy, RMIT University. Bundoora VIC, (Australia). ieva.stupans@rmit.edu.au
Vincent CHAN. BPharm, MPH, PhD. Senior Lecturer. School of Health and Biomedical Sciences, Discipline of Pharmacy, RMIT University. Bundoora VIC (Australia). vincent.chan@rmit.edu.au

Interestingly, despite the importance of clinical guidelines to clinical practice, studies investigating whether guidelines are generally adhered to, or evidence supporting that clinical guidelines are being followed by healthcare professionals (particularly pharmacists) are quite variable. For example, despite significant efforts to promote and support guideline use, evidence indicates that adherence to guidelines by healthcare professionals is often suboptimal.[11,12]

Thus, given the currently limited published literature in this context, it is important to understand and explore the views and perceptions of community pharmacist on the usefulness of clinical guidelines on pain and fever management, as well as assessing their usual practices, particularly investigating whether Australian pharmacists appreciate clinical guidelines, and apply them in this context.

The aim of this study was to investigate the current views and self-reported practices of Australian community pharmacists in pain and fever management, how they compared to current clinical guidelines and recommendations, and to identify the potential gaps and opportunities in this space.

METHODS

Ethics approval

This study was approved by the Human Research Ethics Committee of the study institution (Approval number: SEHAPP 99-17).

Study participants

This study was designed as a cross-sectional study to capture the current views and self-reported practices of Australian practicing community pharmacists in commonly encountered pain and fever management, as well as their views on clinical guidelines. Data collection was conducted over an approximately eight-week period (March-May 2018). Participation involved completing an anonymous online survey that took approximately 10 minutes. This survey was open to all community pharmacists across Australia, although it is estimated that survey participants would be predominately pharmacists in Victoria, due to the recruitment. Implied consent was sought by completion of the survey. The investigators were responsible for the initial recruitment of pharmacists via local industry contacts and the Pharmaceutical Society of Australia newsletter, with further recruitment through snowball sampling.

Questionnaire

An anonymous, self-administered questionnaire was developed to collect a broad range of data from Australian community pharmacists. Qualtrics software was used to develop and deliver the online questionnaire.

Questions were developed under four sections. To ensure that a broad range of pharmacist responses were captured, demographic data such as age, gender, employment status, area of primary employment, tertiary qualifications and approximate years of experience as an Australian registered pharmacist were obtained.

The main body of the questionnaire consisted of questions relating to daily pharmacy practice observations, which included questions on the most common types of pain, and the frequency of over-the-counter (OTC) analgesic requests. In the next section, pharmacists were presented with a series of hypothetical case scenarios of patients presenting to the pharmacy with symptoms of either fever or pain with different severities. The case scenarios are patient-based presentations typically seen in an Australian community pharmacy setting. Examples of scenarios include: general mild to severe musculoskeletal pain, headaches, migraines, osteoarthritis and fever; as well as preference for treatment options relating to adults and paediatric assessments of fever. Pharmacists were provided with a number of different available treatment (no brand names were used) and referral options, and were asked to select their preferred treatment strategy in each case (given that there are no contraindications in the case scenarios).

The final section of the questionnaire consisted of a series of categorical questions (5-point Likert scale ranging from Strongly disagree to Strongly agree) investigating the pharmacist's views and opinions on their knowledge, training, clinical guidelines and clinical experience in the context of pain and fever management.

The questionnaire underwent a series of pilot tests with a small group of pharmacists and pharmacy academics before final release. The survey was preliminarily pre-tested for ease of use and to identify any technical or interpretative issues, and a second round of pilot tests were conducted before the questionnaire was made available to Australian community pharmacists.

Data analysis

Statistical tests and descriptive statistics were conducted (using SPSS version 18) to assess responses to the questionnaire. A Chi-square goodness-of-fit analysis was also performed to specifically compare the demographic parameters of age and gender distributions of this study's surveyed population with Pharmacy Board registrant data to assess sampling and external validity.

RESULTS

Of the total of 149 pharmacists who attempted the survey, 36 incomplete submissions were excluded, with 113 completed responses used for this study. Table 1 describes the participant demographics. Registrant data was retrieved from the Pharmacy Board of Australia for the period 1 January-31 March 2018.[13] The eligible responses (n=113) were multiplied by the proportions of each category in the registrant data, to determine the expected frequency of responses to the survey. The expected frequency was then compared to the actual/observed frequency of responses to the survey to determine any distribution differences between the survey data of pharmacists in this study, and the registrant data of pharmacists.

The chi-square goodness-of-fit test showed a statistically significant difference in the age distribution between the survey and registrant data (computed chi-square value (chi-

Table 1. Demographic distribution from questionnaire

Characteristic	%
Age	
20-24 years	13.3
25-35 years	54.9
36-45 years	13.3
46-55 years	8.0
56-65 years	6.2
65+ years	4.4
Gender	
Male	32.7
Female	67.3
Primary place of practice	
Metropolitan	69.0
Regional	22.1
Rural	8.8
Approximate years of experience as a pharmacist	
1-4 years	44.2
5-10 years	26.5
11-14 years	9.7
15-20 years	2.7
21-24 years	0.9
25+ years	15.9
Primary pharmacy qualification obtained in Australia	
Yes	91.2
No	8.8
Work status	
Full time	71.7
Part time	19.5
Casual/Locum	8.8
Highest qualification	
Bachelor	64.6
Post Grad Cert/Dip	16.8
Master	14.2
Doctorate	4.4

square=37.470) was more than the critical value (chi-square=11.071, at df=5, alpha=0.05)). Although there appears to be a similar trend between the proportions of the survey and registrant data, the proportions of the age groups under 34 years in the survey data appear to be over-represented, and the age groups over 35 years appear to be under-represented, when compared to registrant data. However, there was no statistically significant difference in the distribution of gender between the registrant and survey data (computed chi-square value (chi-square=1.351) was less than the critical value (chi-square=3.841, at df=1, alpha=0.05)). This indicates that the survey sample distribution based on gender is a reasonable representative of the greater population of Australian pharmacists.

There was a range of pharmacists who held experience in other aspects of pharmacy besides the community setting. Of the 113 respondents who completed the survey, approximately 16% of pharmacists held employment in academia, while more than 13% held employment in hospital settings.

Back pain (31%) and non-specific musculoskeletal pain (29%) were the two most commonly encountered types of pain reported by pharmacists. While in their daily practice, 56% of pharmacist report 50% or more of their OTC encounters were patients requesting OTC analgesics.

Paracetamol was the medicine of choice for fever across all ages (Table 2). Additionally, it was also generally observed that paracetamol was the preferred choice for most mild to moderate pain scenarios; while anti-inflammatory drugs or 'referral' was preferred for severe pain scenarios (Table 3). It was also observed that the 'Paracetamol+ibuprofen' combination was generally preferred for more severe cases only (Table 3).

Paracetamol was the medicine of choice for mild headaches; however the preference for 'ibuprofen' or combination 'Paracetamol+ibuprofen' increases as severity increase (Table 3). Aspirin was the medicine of choice in adult mild-moderate migraines; with 'Referral' being the option of choice for severe migraine (Table 3). Paracetamol was the medicine of choice for mild-moderate osteoarthritis (Table 3). Ibuprofen was the medicine of choice for adult mild musculoskeletal pain; 'Diclofenac' or 'refer' were the options of choice as severity increases (Table 3).

Only approximately half of the pharmacists report having recent pain management training. Majority of the pharmacists agreed that guidelines are both useful and important, however, many also believed that "Clinical experience" is just as important as following clinical guidelines (Table 4 & Table 5). Majority indicated that their knowledge of pain and fever management were good (Table 4 & 5), however, it was also noted that majority of the pharmacists strongly agree/agree (89%) that they would benefit from more training/education on pain management (Table 4). Overall, 'paracetamol' (72%) was generally preferred as a recommendation over 'ibuprofen' (Table 4).

DISCUSSION

This study examined views and self-reported practices of Australian community pharmacists in commonly encountered pain and fever management, as well as their views on clinical guidelines. Results demonstrated that paracetamol and ibuprofen were the two options of choice, with paracetamol generally preferred as a recommendation; and that pharmacists value both guidelines as well as experience when making therapeutic decisions.

Paracetamol vs ibuprofen

Non-prescription medicines such as paracetamol and ibuprofen are important OTC medicines readily available and are important treatment components in primary healthcare for minor ailments such as pain and fevers.

Table 2. Treatment options selected by pharmacists for fever case scenarios

%	Non-Drug Intervention	Paracetamol	Ibuprofen	Aspirin	Paracetamol /Ibuprofen	Referral	Other/s
6-month old Infant	3.5	76.1	1.8	0	0	3.5	0.9
5-year old Child	3.5	83.2	2.7	0	1.8	3.5	0
Teenager	2.7	79.6	5.3	0	8.0	1.8	0
Adult	1.8	71.7	6.2	0.9	15.9	1.8	0

Table 3. Treatment options selected by pharmacists for adult presentations of musculoskeletal, tension headache, migraine headache and osteoarthritis pain scenarios

%	Paracetamol	Ibuprofen	Diclofenac	Aspirin	Paracetamol/ Ibuprofen	Ibuprofen Gel	Diclofenac Gel	Referral	Other/s
Musculoskeletal Pain									
Mild	15.0	40.7	11.5	0	10.6	2.7	12.4	0.9	6.2
Moderate	4.4	23.0	36.3	0	26.4	1.8	1.8	0.9	5.4
Severe	0	1.8	21.2	0	19.5	0	0.9	41.6	15.0
Tension Headache Pain									
Mild	39.8	27.4	0	7.0	14.2	0	0	0.9	10.7
Moderate	14.2	16.9	0.9	10.6	38.9	0	0	3.5	15.0
Severe	1.8	3.5	1.8	6.2	19.5	0	0	52.2	15.0
Migraine Headache Pain									
Mild	14.2	21.2	0	35.4	18.6	0	0	2.7	7.9
Moderate	0.9	11.5	1.8	31.9	31.0	0	0	3.5	19.4
Severe	0	1.8	1.8	13.3	6.2	0	0	52.2	24.7
Osteoarthritis Pain									
Mild	69.0	3.5	2.7	0	7.1	0	10.6	0.9	6.2
Moderate	30.1	5.3	11.5	0	31.9	0	4.4	4.4	12.4
Severe	2.7	0	7.1	0	14.2	0	0	65.5	10.5

Patients frequently visit the pharmacists for pain treatment and patients frequently use OTCs to self-manage their pain.[14,15]

Although studies and meta-analyses comparing the effectiveness, safety and tolerability profiles of paracetamol and ibuprofen have led to variable conclusions, many studies identified that ibuprofen is as safe and effective as paracetamol in many basic analgesic and fever scenarios, in both adult and paediatric populations.[16-20] Despite this, globally paracetamol is still perceived as having a better safety and overall better tolerability profile than ibuprofen.[17] It was also suggested several reasons why this perception exists, including lack of distinction between the different Non-steroidal anti-inflammatory drugs (NSAIDs) resulting in a "class effect bias"; ingrained negative perceptions of NSAIDs, as well as lack of overall understanding with regards to ibuprofen safety and tolerability, and the lack of confidence to put this knowledge into practice.[17] However, it is important to also recognise the risk of hepatic toxicity associated with paracetamol, particularly in high doses.

Interestingly, despite the popularity of OTC paracetamol and ibuprofen use, studies examining perceptions and practices of healthcare professionals and their preference for recommending paracetamol or ibuprofen are quite limited. One study examining non-prescription medicines for pain and fever identified that paracetamol was clearly the recommendation of choice by pharmacy staff, compared to NSAIDs.[21] Furthermore, that study also reported a small proportion of staff recommending NSAIDs when paracetamol was requested by the patient.[21] This is supported in a large national cross-sectional study of NSAID use by GPs, paediatricians and pharmacists where NSAIDs were only recommended in a minority of cases.[22] Furthermore, it was identified that NSAIDs use was generally associated with older children, higher temperatures, pain due to otitis and in the absence of a rash or gastroenteritis.[22] In a study looking at analgesics recommended by dentists and pharmacists, it was reported that ibuprofen was the OTC analgesic preferred and recommended by majority of both dentists and pharmacists for toothache relief in adults, with paracetamol as the second-choice agent.[23]

Choice of NSAID

Aspirin, ibuprofen, diclofenac and naproxen are the four OTC non-selective NSAIDs available in different formulations in Australia. The current Australian Therapeutic Guidelines suggests paracetamol remains the first-line treatment option for mild acute pain when non-pharmacological treatment strategies are inadequate.[10] As the severity of pain increases, the use of a NSAID may be warranted and the choice of which NSAID is at the healthcare professional's discretion. In moderate acute pain, clinical guidelines list ibuprofen as the drug of choice because of the widespread experience with its use.[10] In migraine pain presentations, guidelines suggest the use of high dose (900-1000 mg) soluble aspirin as a suitable NSAID. Results of this study suggest that Australian

Table 4. Community pharmacists' views and perceptions on pain management

%	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) My knowledge of PAIN management is good	1.8	4.4	19.5	63.7	10.6
b) I could benefit from some additional training when it comes to PAIN management	1.8	0	8.8	61.1	28.3
c) Clinical guidelines are USEFUL when it comes to PAIN management	0.9	3.5	11.5	61.9	22.1
d) Following clinical guidelines is IMPORTANT when it comes to PAIN management	0.9	0.9	19.5	61.1	17.7
e) Clinical experience is more useful than following clinical guidelines when it comes to PAIN management	0.9	27.4	35.4	25.7	10.6
f) Me general preference is to recommend paracetamol over ibuprofen	0.9	8.0	19.5	51.3	20.4

Table 5. Community pharmacists' views and perceptions on fever management

%	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) My knowledge of FEVER management is good	0.9	4.4	14.2	65.5	15.0
b) Clinical guidelines are USEFUL when it comes to FEVER management	0.9	0.9	10.6	76.1	11.5
c) Following clinical guidelines is IMPORTANT when it comes to FEVER management	0.9	0.9	16.8	65.5	15.9
d) Clinical experience is more useful than following clinical guidelines when it comes to FEVER management	3.5	23.0	42.5	26.5	4.4

pharmacists are aware of the fact that soluble aspirin is the drug of choice in migraine pain symptoms, since it was the most selected treatment option in the hypothetical migraine pain cases. The Australian Medicines Handbook (AMH) advises medical practitioners and pharmacists that approximately 60% of patients will respond to any NSAIDs, and those who do not respond to one may respond to another.[24]

Diclofenac has the least potential of causing gastrointestinal side effects but has the highest risk of causing adverse cardiovascular effects.[10,24,25] Results from this study identified that diclofenac was the NSAID of choice as the severity of musculoskeletal pain increases in the hypothetical case scenarios. Motives behind the popularity of diclofenac in these instances remain unclear, although its availability in a specialised oral formulation with a more rapid absorption rate, and the fact that diclofenac has the shortest half-life, could be contributing reasons.[10,26] The results in this particular section are not attuned to the recommendations of the clinical guidelines as diclofenac is listed as a second-line therapy (after ibuprofen) for moderate symptoms of pain.[27] However, it is important to note that clinical guidelines do not provide conclusive information on the comparative efficacy of the varying NSAID options, and hence guidelines advise health professionals to select a suitable NSAID based on patient comorbidities.[10] Although studies comparing the effectiveness and safety profiles of diclofenac to other NSAIDs have led to variable conclusions, studies have identified that diclofenac is no more effective than other NSAIDs such as ibuprofen.[27-31] The difference between the results in the moderate pain scenarios and clinical guideline recommendations for moderate pain management highlights that there may be additional factors influencing a pharmacist's decision when recommending a suitable NSAID option.

Clinical guidelines vs clinical experience

Both clinical guidelines and clinical experience are critical to the application of evidence-based practice and are essential to patient care. The growth of research evidence impacts its translation into clinical guidelines, which impacts clinical practice.[5] Many chronic conditions such as pain is currently under-diagnosed and under-treated and is likely to worsen unless there is a wider adoption of best pain management practice.[32] Primary care management should be holistic and evidence-based, incorporating both pharmacological and non-pharmacological approaches, including complementary therapies and comprehensive management programs.[33]

Although there is evidence to support the role of the community pharmacist in chronic disease management, it has been identified that a pharmacist's skills, for example pain management, is often not fully utilised.[34,35] Evidence suggests that chronic non-cancer pain (CNCP) management in primary care is suboptimal and barriers to optimal management are numerous.[36] These includes clinician's knowledge and experience, particularly their perceptions on following and trusting in clinical guidelines. It is recognised that whilst guideline recommendations should be acknowledged, their implementation in practice may differ due to the complexity of perceptions and expectations, and due to the importance of focussing on the patient holistically.[5]

Interestingly, despite the importance of clinical guidelines to clinical practice, evidence supporting that clinical guidelines are being followed by healthcare professionals (particularly pharmacists) are more limited and variable. Despite significant efforts to promote and support guideline use, evidence indicates that adherence to guidelines for both pain and fever is often suboptimal despite its availability.[11,12,22,37,38] It has been suggested that some pharmacists may even lack adequate knowledge of evidence-based practice for OTC medicines and make recommendations that lacks evidence.[39] Further, it has also been identified that barriers to adherence vary not only across guidelines but also across recommendations within guidelines.[11]

Understanding and identifying barriers to evidence-based guidelines' uptake is critical to closing the "evidence-practice" gap.[12] It has been suggested that the use of guidelines is influenced by the believability of the underlying evidence, the health practitioner's consultation style, and uncertainties surrounding diagnosis and treatment.[5] Other barriers include perceptions of the condition's seriousness, clinicians' preparedness, clinicians' personal beliefs, and dissonant patient expectations.[40] A systematic review also identified that many clinicians viewed guidelines were categorical, prescriptive, and constrained professional practice.[12] Other studies among GPs have also demonstrated that barriers across guideline adherence are patient related, suggesting that guidelines do not always adequately incorporate patient preferences, needs and abilities.[11]

Additionally, it was also noted that popular clinical practices superseded the guidelines, with adherence to following protocols decreasing with increasing physician experience.[41] Interestingly, clinicians' perceptions of guidelines often also demonstrates a lack of content knowledge, as well as a lack of appreciation of and trust in how guidelines are developed.[12] This indicates that targeted education on these aspects could be important in this context.

Limitations and future directions

Although a broad range of demographics were captured, it is likely that the pharmacists in this study do not fully represent all pharmacists. A larger sample size will increase generalizability of the results. To assess this, demographics data was compared with the Pharmacy Board registrant data. Furthermore, potential selection bias may also exist that can also influence sample representativeness. Another limitation of this study was that it was only designed to assess self-reported practice; the use of the simulated patient technique may be a more appropriate way to assess actual practice. Indeed, the use of simulated patients to assess analgesic recommendations have previously been reported in other contexts.[42,43] Additionally, as this was a self-reported survey, response bias is possible. To minimise this, pharmacists were not explicitly told that their views were being compared to guidelines and were simply asked to suggest their recommendation of choice for the scenarios. To extend this work, it would be useful to further identify specific areas where practices may not align with guidelines, as well as further understanding how best practice guidelines can be optimally utilised to guide practice and decision making, including key drivers and barriers for specific views and practices, with the ultimate goal of improving patient care and health outcomes.

CONCLUSIONS

Pain and fever symptoms are common presentations experienced by Australians and inadequate assessment and management can result in significant impacts on the health and wellbeing of patients. Majority of the pharmacists in this study report and demonstrate good knowledge of pain and fever management. Furthermore, this study also comprehensively reported the practices of Australian community pharmacists in various pain and fever scenarios, as well as their views on pain and fever management and clinical guidelines. Although healthcare professionals largely accept and adopt relevant evidence-based clinical guidelines, they may not always be strictly followed. Results from this study suggest a great potential to structure and develop further research studies in this space, as well as the importance to further facilitate training, education and resources for pharmacists that are consistent with the recommendations outlined by clinical guidelines and latest available evidence.

ACKNOWLEDGEMENTS

The authors would like to thank the pharmacists who participated in the survey for their valuable insights and comments. We would also like to acknowledge Reckitt Benckiser Australia for supporting this study, and CHE Proximity for assisting with the communications and facilitation of this study.

CONFLICT OF INTEREST

This study was supported in part by a research agreement with Reckitt Benckiser Australia. The authors' work and results of this study were otherwise independent of the funders. The authors have no other affiliations with the funders.

FUNDING

This study was supported in part in a research agreement with Reckitt Benckiser Australia. The funding had no impact on the study and survey development, results, or the analyses of the results of this independent study. Reckitt Benckiser has a health portfolio in pain and fever management products, however there were no references to the company or specific brand products in the questionnaire.

References

1. Benrimoj SI, Frommer MS. Community pharmacy in Australia. Aust Health Rev. 2004;28(2):238-246.
2. Roberts AS, Benrimoj SIC, Chen TF, Williams KA, Hopp TR, Aslani P. Understanding practice change in community pharmacy: a qualitative study in Australia. Res Social Adm Pharm. 2005;1(4):546-564. https://doi.org/10.1016/j.sapharm.2005.09.003
3. Cannings J, Francis C, Jessop R. Consumer needs executive summary - 5th community pharmacy agreement. Australian Government Department of Health; 2015.
4. Amorin-Woods L, Beck R, Parkin-Smith G, Lougheed J, Bremner A. Adherence to clinical practice guidelines among three primary contact professions: a best evidence synthesis of the literature for the management of acute and subacute low back pain. J Can Chiropr Assoc. 2014;58(3):220-237.
5. Corbett M, Foster N, Ong BN. GP attitudes and self-reported behaviour in primary care consultations for low back pain. Fam Pract. 2009;26(5):359-364. https://doi.org/10.1093/fampra/cmp042
6. El-Radhi AS, El-Radhi AS, Carroll J, Klein N. Clinical Manual of Fever in Children. El-Radhi ASe, Carroll Je, Klein Ne, editors. Berlin: Springer; 2009.
7. Strong J, Melzack R, Van Griensven H, Strong J, Unruh AM. Pain : a textbook for health professionals. Second edition. ed. Edinburgh, New York: Churchill Livingstone/Elsevier; 2014.
8. Australian Bureau of Statistics. Characteristics of bodily pain in Australia. 4841.0- Facts at your fingertips. Available at: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4841.0Chapter12011 (accessed Dec 20, 2018).
9. NICE. Fever in under 5s: assessment and initial management [Internet]. United Kingdom: National Institute for Health and Care Excellence. Available from: https://www.nice.org.uk/guidance/cg160 (accessed Dec 20, 2018).
10. Acute pain: a general approach, In: eTG complete. Melbourne: Therapeutic Guidelines Limited; 2018.
11. Lugtenberg M, Burgers JS, Besters CF, Han D, Westert GP. Perceived barriers to guideline adherence: a survey among general practitioners. BMC Fam Pract. 2011;12:98. https://doi.org/10.1186/1471-2296-12-98

12. Slade SC, Kent P, Patel S, Bucknall T, Buchbinder R. Barriers to primary care clinician adherence to clinical guidelines for the management of low back pain. Clin J Pain. 2016;32(9):800-816. https://doi.org/10.1097/AJP.0000000000000324
13. Pharmacy Board of Australia: Statistics AHPRA. Available at: http://www.pharmacyboard.gov.au/About/Statistics.aspx (accessed Dec 20, 2018).
14. Blyth FM, March LM, Brnabic AJM, Cousins MJ. Chronic pain and frequent use of health care. Pain. 2004;111(1-2):51-58. https://doi.org/10.1016/j.pain.2004.05.020
15. Brabers AEM, Van Dijk L, Bouvy ML, De Jong JD. Where to buy OTC medications? A cross-sectional survey investigating consumers' confidence in over-the-counter (OTC) skills and their attitudes towards the availability of OTC painkillers. BMJ Open. 2013;3(9):e003455. https://doi.org/10.1136/bmjopen-2013-003455
16. Crook J. Fever management: evaluating the use of ibuprofen and paracetamol. Paediatr Nurs. 2010;22(3):22-26. https://doi.org/10.7748/paed2010.04.22.3.22.c7638
17. Kanabar D. A clinical and safety review of paracetamol and ibuprofen in children. Inflammopharmacology. 2017;25(1):1-9. https://doi.org/10.1007/s10787-016-0302-3
18. McSwan J, Scarf A. Managing children's pain and fever with ibuprofen. Aust Pharm. 2017;36(6):28-31.
19. Pierce CA, Voss B. Efficacy and safety of ibuprofen and acetaminophen in children and adults: a meta-analysis and qualitative review. Ann Pharmacother. 2010;44(3):489-506. https://doi.org/10.1345/aph.1M332
20. Wong T, Stang AS, Ganshorn H, Hartling L, Maconochie IK, Thomsen AM, Johnson DW. Combined and alternating paracetamol and ibuprofen therapy for febrile children. Cochrane Database Syst Rev. 2013;(10):CD009572. https://doi.org/10.1002/14651858.CD009572.pub2
21. Bardage C, Westerlund T, Barzi S, Bernsten C. Non-prescription medicines for pain and fever—A comparison of recommendations and counseling from staff in pharmacy and general sales stores. Health Policy. 2013;110(1):76-83. https://doi.org/10.1016/j.healthpol.2012.12.006
22. Bertille N, Pons G, Fournier-Charrière E, Khoshnood B, Chalumeau M. National cross-sectional study of nonsteroidal anti-inflammatory drugs use highlights differences between parents and professionals and prompts safety concerns. Acta Paediatr. 2016;105(11):e543-e548. https://doi.org/10.1111/apa.13566
23. Bhati M, Duxbury AJ, Macfarlane TV, Downer MC. Analgesics recommended by dentists and pharmacists, and used by the general public for pain relief. Int J Health Promot Educ. 2000;38(3):95-103. https://doi.org/10.1080/14635240.2000.10806157
24. Australian Medicines Handbook. Adelaide: Australian Medicines Handbook Pty; 2018.
25. Olsen AM, Fosbøl EL, Lindhardsen J, Andersson C, Folke F, Nielsen MB, Køber L, Hansen PR, Torp-Pedersen C, Gislason GH. Cause-specific cardiovascular risk associated with nonsteroidal anti-inflammatory drugs among myocardial infarction patients--a nationwide study. PLoS One. 2013;8(1):e54309. https://doi.org/10.1371/journal.pone.0054309
26. Becker WJ. Acute Migraine Treatment in Adults. Headache. 2015;55(6):778-793.
27. Rainsford KD. Ibuprofen: pharmacology, efficacy and safety. Inflammopharmacology. 2009;17(6):275-342. https://doi.org/10.1007/s10787-009-0016-x
28. Collins SL, Moore RA, McQuay HJ, Wiffen PJ. Oral ibuprofen and diclofenac in post-operative pain: a quantitative systematic review. Eur J Pain. 1998;2(4):285-291. https://doi.org/10.1016/S1090-3801(98)90027-1
29. Gazal G, Al-Samadani KH. Comparison of paracetamol, ibuprofen, and diclofenac potassium for pain relief following dental extractions and deep cavity preparations. Saudi Med J. 2017 Mar;38(3):284-291. https://doi.org/10.15537/smj.2017.3.16023
30. Morán M. An observer-blind comparison of diclofenac potassium, piroxicam and placebb in the treatment of ankle sprains. Curr Med Res Opin. 1990;12(4):268-274. https://doi.org/10.1185/03007999009111657
31. Moore N. Diclofenac Potassium 12.5mg Tablets for Mild to Moderate Pain and Fever. Clin Drug Investig. 2007;27(3):163-195. https://doi.org/10.2165/00044011-200727030-00002
32. Pergolizzi J, Ahlbeck K, Aldington D, Alon E, Coluzzi F, Dahan A, Huygen F, Kocot-Kępska M, Mangas AC, Mavrocordatos P, Morlion B, Müller-Schwefe G, Nicolaou A, Pérez Hernández C, Sichère P, Schäfer M, Varrassi G. The development of chronic pain: physiological CHANGE necessitates a multidisciplinary approach to treatment. Curr Med Res Opin. 2013;29(9):1127-1135. https://doi.org/10.1185/03007995.2013.810615
33. Mills S, Torrance N, Smith BH. Identification and management of chronic pain in primary care: a review. Curr Psychiatry Rep. 2016;18(2):22. https://doi.org/10.1007/s11920-015-0659-9
34. George PP, Molina J, Cheah J, Chan SC, Lim BP. The evolving role of the community pharmacist in chronic disease management-a literature review. Ann Acad Med Singapore. 2010;39(11):861-867.
35. Kress H-G, Aldington D, Alon E, Coaccioli S, Collett B, Coluzzi F, Huygen F, Jaksch W, Kalso E, Kocot-Kępska M, Mangas AC, Ferri CM, Mavrocordatos P, Morlion B, Müller-Schwefe G, Nicolaou A, Hernández CP, Sichère .. A holistic approach to chronic pain management that involves all stakeholders: change is needed. Curr Med Res Opin. 2015;31(9):1743-1754. https://doi.org/10.1185/03007995.2015.1072088
36. Lalonde L, Choinière M, Martin E, Lévesque L, Hudon E, Bélanger D, Perreault S, Lacasse A, Laliberté MC. Priority interventions to improve the management of chronic non-cancer pain in primary care: a participatory research of the ACCORD program. J Pain Res. 2015;8:203-215. https://doi.org/10.2147/JPR.S78177
37. Williams CM, Maher CG, Hancock MJ, McAuley JH, McLachlan AJ, Britt H, Fahridin S, Harrison C, Latimer J. Low back pain and best practice care: a survey of general practice physicians. Arch Intern Med. 2010;170(3):271-277. https://doi.org/10.1001/archinternmed.2009.507
38. Raffaeli G, Orenti A, Gambino M, Peves Rios W, Bosis S, Bianchini S, Tagliabue C, Esposito S. Fever and pain management in childhood: healthcare providers' and parents' adherence to current recommendations. Int J Environ Res Public Health. 2016;13(5):499. https://doi.org/10.3390/ijerph13050499

39. Hanna LA, Hughes CM. Pharmacists' attitudes towards an evidence-based approach for over-the-counter medication. Int J Clin Pharm. 2012;34(1):63-71. https://doi.org/10.1007/s11096-011-9586-y
40. Egerton T, Diamond L, Buchbinder R, Bennell K, Slade S. A systematic review and evidence synthesis of qualitative studies to identify primary care clinicians' barriers and enablers to the management of osteoarthritis. Osteoarthritis Cartilage. 2017;25(5):625-638. https://doi.org/10.1016/j.joca.2016.12.002
41. Teng KA, Butler RS, Schramm S, Isaacson JH, Nielsen C, Paradis C. Physicians caring for physicians: the perspective of the primary care physician. South Med J. 2014;107(5):301-305. https://doi.org/10.1097/SMJ.0000000000000095
42. Abdu-Aguye SN, Shehu A, Ahmad UI. Management of musculoskeletal pain in retail drug outlets within a Nigerian community: a descriptive study. Pharm Pract (Granada). 2017;15(1):873. https://doi.org/10.18549/PharmPract.2017.01.873
43. Santos AP, Mesquita AR, Oliveira KS, Lyra DP Jr. Assessment of community pharmacists' counselling skills on headache management by using the simulated patient approach: a pilot study. Pharm Pract (Granada). 2013;11(1):3-7.

Sacre H, Tawil S, Hallit S, Hajj A, Sili G, Salameh P. Attitudes of Lebanese pharmacists towards online and live continuing education sessions. Pharmacy Practice 2019 Apr-Jun;17(2):1438.
https://doi.org/10.18549/PharmPract.2019.2.1438

Original Research

Attitudes of Lebanese pharmacists towards online and live continuing education sessions

Hala SACRE, Samah TAWIL, Souheil HALLIT, Aline HAJJ, Georges SILI, Pascale SALAMEH.
Received (first version): 28-Dec-2018 Accepted: 26-Apr-2019 Published online: 4-Jun-2019

Abstract

Background: Continuing education (CE) is an internationally recommended approach as a lifelong learning model for pharmacists, enabling them to maintain the necessary knowledge, skills and ethical attitudes so as to remain current and competent in their practice.

Objectives: The objective of this study is to 1) describe factors associated with taking different types of CE courses among pharmacists in Lebanon, and 2) assess the correlation between types of CE activity and the attitude of Lebanese pharmacists (motivation and value) and their computer literacy.

Methods: This is a cross-sectional observational study conducted between February and May 2017, using a random sample of Lebanese pharmacists from all districts of Lebanon. All pharmacists were eligible to participate; the sample consisted of those who agreed to complete the questionnaire. The questionnaire includes questions about computer literacy, motivation and value about CE, in addition to sociodemographic characteristics of pharmacists.

Results: Out of the 750 questionnaires distributed, 628 (83.73%) were filled out and returned to be analyzed. The mean age of the participants was 39.04 (SD 10.57) years, 66.9% of them were females, and 41.1% of them had a bachelor degree in pharmacy and worked in Mount Lebanon. Among the 628 respondents, 567 (90.3%) have earned at least one CE credit. Of those, 5.4% took mainly online courses, 15.4% took mainly live courses and the remaining took both types of CE. Higher motivation (aOR=1.05; CI 0.994-1.109) and higher value (aOR=1.076; CI 0.968-1.197) were associated with higher odds of taking live CE courses. Higher motivation (aOR=1.07; 95%CI 0.994-1.152) was associated with higher odds of taking online CE courses. Higher motivation (aOR=1.059; 95%CI 1.006-1.114) and higher general confidence with computer use (aOR=1.058; 95%CI 1.012-1.106) were significantly associated with higher odds of taking both types of CE courses.

Conclusions: A high percentage of Lebanese pharmacists enrolled in the CE system, mainly driven by motivation and value of CE, in addition to a higher general confidence in computer use. Further efforts should be exerted by the Lebanese Order of Pharmacists to motivate pharmacists and help them improve their computer literacy, which is expected to improve not only enrollment in CE activities, but also the completion of their CE requirements.

Keywords

Education, Pharmacy, Continuing; Attitude to Computers; Computer Literacy; Pharmacists; Motivation; Attitude of Health Personnel; Surveys and Questionnaires; Multivariate Analysis; Lebanon

INTRODUCTION

Continuing education (CE) is an internationally recommended approach to lifelong learning for pharmacists and other health care professionals, enabling them to acquire the necessary knowledge, skills and ethical attitudes, while remaining current and competent in their practice.[1,2]. Regulatory bodies in many countries have the responsibility to ensure the enrollment of health care professionals to CE programs. In a changing and increasingly complex profession, and with rapid medical and technological advances, the need for lifelong learning for pharmacists is irrefutable as it has been shown to increase the knowledge of pharmacists about several topics of importance to their practice; this is expected to have positive effects on patients' outcomes and is motivating pharmacists to enroll in CE programs.[3,4] In fact, motivation is an important factor in adult learning because it is where their ideas and emotions join to fulfill personal, cultural, and spiritual commitments.[5]

Nevertheless, despite the importance of CE, some pharmacists are still reluctant to adhere to CE programs: several factors (lack of time, long distances, costs, etc.) constitute barriers to enroll in CE programs, and many studies evaluated these barriers and suggested solutions to overcome it.[6-8] Moreover, some learners feel that they are self-learners and prefer individual work over a collaborative activity: in the US, the Institute of Medicine described self-directed learning by "an approach to learning whereby the structure, planning, implementation, and evaluation of learning are initiated by the learner".[9] Thus, one solution to overcome barriers to live CE attendance and please self-learners was the introduction of new technologies, such as online learning: in fact, e-learning rapidly became a part of undergraduate courses and an adjunct to traditional

Hala SACRE. PharmD. Drug Information Center, Order of Pharmacists of Lebanon; & INSPECT-LB: Institut National de Santé Publique, Epidémiologie Clinique et Toxicologie. Beirut (Lebanon). halasacre@hotmail.com
Samah TAWIL. PharmD, MPH. Drug Information Center, Order of Pharmacists of Lebanon. Beirut (Lebanon). samah.tawil@opl.org.lb
Souheil HALLIT. PharmD, MSc, MPH, PhD. INSPECT-LB: Institut National de Santé Publique, Epidémiologie Clinique et Toxicologie; & Faculty of Medicine and Medical Sciences, Holy Spirit University of Kaslik (USEK). Jounieh (Lebanon). souheilhallit@hotmail.com
Aline HAJJ. PharmD, PhD. Faculty of Pharmacy, Saint-Joseph University; & Laboratoire de Pharmacologie, Pharmacie Clinique et Contrôle de Qualité des Médicaments, Saint-Joseph University. Beirut (Lebanon). aline.hajj@hotmail.com
Georges SILI. PharmD. Drug Information Center, Order of Pharmacists of Lebanon. Beirut (Lebanon). gmsili@hotmail.com
Pascale SALAMEH. PharmD, MPH, PhD. INSPECT-LB: Institut National de Santé Publique, Epidémiologie Clinique et Toxicologie; & Faculty of Pharmacy and Faculty of Medicine, Lebanese University. Beirut (Lebanon). pascalesalameh1@hotmail.com

learning activities for healthcare professionals in many countries, especially Europe, USA, Australia, and Canada.[10] Evidence from Great Britain indicates that the majority of pharmacists were able to demonstrate they can self-direct their learning at the required level.[11,12] Consequently, computer skills play a major role in the preference of the type of CE activity. In Australia, pharmacists prefer self-learning online activities due to barriers of accessibility to reach conferences, in terms of time, location and cost, but the lack of confidence in using technology might still be affecting the choice of pharmacists regarding the type of CE programs.[13]

In Lebanon, the total number of registered pharmacists is 7391 with 61.1% females, and the highest percentage of pharmacists work in a community setting (47.2%). In January 2014, the Lebanese Order of Pharmacists (OPL, the official pharmacists' association in Lebanon) started implementing the law number 190 that was enacted in November 18, 2011, on mandatory CE to Lebanese pharmacists.[14] This law stipulates that all pharmacists living in Lebanon and registered with the OPL are required to complete 15 CE credits per year of which at least 5 should be live, in order not to lose their registration with to the OPL. In Lebanon, registration with the OPL is mandatory to practice pharmacy after earning a pharmacy degree and passing the national examination termed "colloquium".[15,16]

To help pharmacists complete their live requirements, the OPL organized scientific annual congresses, professional days and conferences in Beirut and remote regions. No tests are performed nor required to earn credits related to these live activities, but the attendance is strictly monitored. The OPL also acquired a Learning Management System (LMS) for online courses of interest to many sectors of the profession, where participants must pass a test (passing grade 80%) after taking the course. This LMS, available through the OPL e-Library platform, records all the activities and allows generating reports with detailed activity per pharmacist. It also allows the administrator to add external activities (not organized by the OPL) so all the credits can be retrieved in one file. It is accessible from any connected device (phone, tablet or computer) thus, pharmacists can take their required credits anywhere anytime .[17] All CE activities (online and live) are offered to the pharmacists free of charge, as stipulated by the law.

There are few published studies in Lebanon showing the extent to which Lebanese pharmacists from different professional sectors are currently involved in CE programs, their value and motivation towards CE, and the type of CE activities they prefer. For this sake, the objective of the present study is to 1) describe factors associated with taking different types of CE courses among pharmacists in Lebanon, and 2) assess the correlation between types of CE activities and the attitude of Lebanese pharmacists (motivation and value) and their computer literacy.

METHODS

Study Design

This is a cross-sectional observational study conducted between February and May 2017, using a random sample of Lebanese pharmacists from all districts of Lebanon. All pharmacists were eligible to participate; the sample consisted of those who agreed to complete the questionnaire.

Data collection

Data collection was done by a team of pharmacists who were not related to the study. Prior to the questionnaire administration, they explained the study objectives that are stated at the beginning of the questionnaire with no further information to avoid influencing respondents. After obtaining an oral approval, the participant was handed the self-administered questionnaire. The investigator remained at the disposition of the participant for any clarification needed. Each questionnaire required 15 minutes to complete.

Sample size and questionnaire distribution

According to the Epi info sample size calculations, providing a population size of 7391 pharmacists (OPL, 2017), a confidence level of 95%, a margin of error of 4%, and since 67% of the pharmacists have enrolled in the CE system (OPL official reports, 2017), a minimal sample of 495 pharmacists was targeted. Based on a comprehensive list of all registered pharmacists provided by the OPL, the questionnaire was distributed to a random sample of 750 pharmacists out of a total of 7391 pharmacists living in Lebanon to take refusals into account; 628 (83.73%) pharmacists filled out and returned the questionnaire.

Questionnaire

The questionnaire was developed and reviewed by ten experienced academics and pharmacy practitioners. It was then piloted on a sample of 10 pharmacists prior to its finalization and distribution. The pilot study revealed no need for modification; its results were thus included in the study. The final version of the questionnaire is presented in Appendix.

The questionnaire comprised four distinct sections. Section 1 clarified socio-demographic characteristics, including years of experience in pharmacy practice, the number of working hours per day, and the highest degree achieved. Section 2 was designed to obtain information about technology and computer literacy; questions included were about the pharmacist's available connected device, the type of smart phone owned, time spent over the internet per day, and some questions about difficulty accessing the OPL e-library and LMS platform to take online courses. In addition, the general confidence with computer use scale18, composed of twelve items, was used to assess computer literacy among community pharmacists. The answers were scored according to a Likert scale (1 for strongly disagree and 5 for strongly agree). The total score was computed by adding the answers to all questions; higher scores would indicate higher computer literacy. Section 3 was designed to assess the pharmacists' communication with OPL, by asking questions about having the OPL mobile application, reading messages the OPL sends through the application or by text message, if the pharmacist is aware about the number of CE credits earned to date and to be completed by the end of December 2019. Section 4 assessed questions about CE. Four questions were used to assess how much the pharmacist values CE and eight questions to assess his/her motivation to enroll in

a CE program respectively.[17,19] For motivation and value of CE, questions were summarized into indices: one for motivation, and one for value. Moreover, questions about reasons for rarely/not adhering to CE were included as well.

Major variables

The major dependent variables were enrolling in the CE system, defined as the earning of at least one CE credit, taking mainly online courses versus no (includes taking live courses, mixed courses, and not taking any CE), taking mainly live courses versus no (includes taking online courses, mixed courses, and not taking any CE). The major independent variables were: motivation for CE, value of CE and computer literacy, as defined in the abovementioned section.

Statistical analysis

Statistical analyses were performed using SPSS version 23 (IBM SPSS Software, Chicago, IL, USA). Descriptive statistics were calculated using mean and standard deviation for continuous measures, counts and percentages for categorical variables.

To confirm the questionnaire construct validity in the Lebanese population, a factor analysis was launched using the principal component analysis technique, with a promax rotation for the motivation, value and general confidence with computer use scales since the extracted factors were found to be significantly correlated. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were ensured to be adequate. The retained number of factors corresponded to Eigenvalues higher than one. Moreover, Cronbach's alpha was recorded for reliability analysis for the different scales. This maneuver was conducted respectively for motivation, value and confidence with computer use scales.

The data was not normally distributed; however, having a big sample size would not affect the use of parametric tests.[20] In the bivariate analysis, the Student t-test was used to compare the means of 2 groups, whereas the ANOVA test was used to compare between 3 or more means. The Pearson correlation coefficient was used to correlate between quantitative variables.

A multinomial regression was conducted using a stepwise method, and taking the type of CE done (none, live only, online only and both types) as the dependent variable. The significance level for variables entering in the multinomial regression model was set at 0.2 to decrease confounding. Adjusted odds ratios (aOR) and 95% confidence intervals (95%CIs) were calculated. A p-value of 0.05 was considered statistically significant.

Ethical aspect

The Lebanese University ethics committee waived the need for approval as the study was observational and respected participants' confidentiality.

RESULTS

Sociodemographic characteristics

Out of the 750 questionnaires distributed, 628 (83.73%) were filled out and returned to be analyzed. Among the 628 respondents, 567 (90.3%) have earned at least one CE credit. Of those, 5.4% declared taking mainly online courses, 15.4% mainly live courses and the remaining both types of CE.

The sociodemographic characteristics of the participants are summarized in Table 1. The mean age of the participants was 39.04 (SD 10.57) years, 66.9% of them were females, and 41.1% of them had a bachelor degree in pharmacy and worked in Mount Lebanon. In addition, the highest percentage of interviewed pharmacists (62.4%) were community pharmacy employers, with a mean years of practicing pharmacy for the whole sample of 13.32 years, a mean of 6.01 working days per week and a mean of 10.56 working hours per day. The results also showed that 373 (59.4%) owned a computer, 355 (56.5%) owned a smart phone. The description of other characteristics of participants can be found in Table 2.

Scales validity and reliability

The description of the answers to each question of the motivation, value and general confidence of computer use can be found in Online appendix Table 1. The Cronbach alpha of the value index was 0.686 and that of the motivation scale was 0.800. As for the computer literacy scale, it was 0.716. The factor analyses conducted on the

Table 1. Sociodemographic characteristics of the sample population.

	N (%)
Gender	
Male	208 (33.1%)
Female	420 (66.9%)
Education level	
Bachelor of Science in Pharmacy	258 (41.1%)
Pharmacy Doctor	249 (39.6%)
Masters	98 (15.6%)
Philosophy Doctor	23 (3.7%)
University you graduated from	
Lebanese University	115 (18.3%)
Saint Joseph University	147 (23.4%)
Beirut Arab University	89 (14.2%)
Lebanese American University	55 (8.8%)
Lebanese International University	61 (9.7%)
American University of Beirut	3 (0.5%)
Outside Lebanon	157 (25%)
Work location	
Not working yet	18 (2.9%)
Beirut	92 (14.6%)
Mount Lebanon	258 (41.1%)
North Lebanon	20 (3.2%)
South Lebanon	120 (19.1%)
Bekaa	119 (18.9%)
Sector of work	
Not working yet	18 (2.9%)
Community employer	391 (62.4%)
Community employee	122 (19.5%)
Hospital/clinical	28 (4.5%)
Scientific office/medical representative	37 (5.9%)
Academia	11 (1.8%)
Public sector	14 (2.2%)
Industry	6 (1%)
	Mean ± SD
Age (in years)	39.04 ± 10.57
Number of years practicing pharmacy	13.32 ± 9.42
Number of working days per week	6.01 ± 1.11
Number of working hours per day	10.56 ± 6.03

Table 2. Descriptive analysis of other characteristics of the pharmacists.

Owning a computer	
No	255 (40.6%)
Yes	373 (59.4%)
Owning a smart phone	
No	273 (43.5%)
Yes	355 (56.5%)
Owning a tablet	
No	565 (90%)
Yes	63 (10%)
Connected to the internet for at least 4 hours per day	
No	54 (8.6%)
Yes	549 (87.4%)
Only when needed	25 (4%)
Ease of accessing OPL e-library account	
Never tried	70 (11.1%)
Easy	242 (38.5%)
Intermediate	211 (33.6%)
Difficult	105 (16.7%)
Ease of accessing OPL LMS platform	
Never tried	94 (15%)
Easy	205 (32.6%)
Intermediate	216 (34.4%)
Difficult	113 (18%)
Having OPL mobile application	
No	96 (15.3%)
Yes	532 (84.7%)
Read OPL messages through the application or by text message	
No	27 (4.3%)
Yes	515 (82%)
Sometimes	86 (13.7%)
Know the number of CE credits earned to date	
No	294 (46.8%)
Yes	216 (34.4%)
More or less	118 (18.8%)
Know the number of CE credits to be completed by December 2019	
No	311 (49.5%)
Yes	198 (31.5%)
More or less	119 (18.9%)
Completed any type of CE	
No	61 (9.7%)
Yes	567 (90.3%)
Completing online CE sessions only	
No	594 (94.6%)
Yes	34 (5.4%)
Completing live CE sessions only	
No	531 (84.6%)
Yes	97 (15.4%)

general confidence scale with computer use, the value and motivation scales are presented in Online appendix Table 2.

Out of all the items of general confidence with computer use scale, none of the items was removed. All items could be extracted from the list, since no items over-correlated to each other (r>0.9), had a low loading on factors (<0.3) or because of a low communality (<0.3). The factor analysis for the general confidence with computer use scale was run over the whole sample (Total n=628). The scale items converged over a solution of two factors that had an Eigenvalue over 1, explaining a total of 57.11% of the variance. A Kaiser-Meyer-Olkin measure of sampling adequacy of 0.878 was found, with a significant Bartlett's test of sphericity (p<0.001).

Out of all the items of the value scale, none of the items was removed. All items could be extracted from the list, since no items over-correlated to each other (r>0.9), had a low loading on factors (<0.3) or because of a low communality (<0.3). The factor analysis for the general confidence with computer use scale was run over the whole sample (Total n = 628). The scale items converged over a solution of one factor that had an Eigenvalue over 1, explaining a total of 67.62% of the variance. A Kaiser-Meyer-Olkin measure of sampling adequacy of 0.773 was found, with a significant Bartlett's test of sphericity (p<0.001).

Out of all the items of the motivation scale, none of the items was removed. All items could be extracted from the list, since no items over-correlated to each other (r>0.9), had a low loading on factors (<0.3) or because of a low communality (<0.3). The factor analysis for the general confidence with computer use scale was run over the whole sample (Total n=628). The scale items converged over a solution of two factors that had an Eigenvalue over 1, explaining a total of 60.86% of the variance. A Kaiser-Meyer-Olkin measure of sampling adequacy of 0.868 was found, with a significant Bartlett's test of sphericity (p<0.001).

Bivariate analysis

The bivariate analysis of factors associated with enrolling in the CE program showed that significantly higher means value and motivation indices were found in pharmacists who enrolled in the CE program compared to those who did not. Significantly higher percentages of pharmacists with PharmD (41.3%) or PhD (3.9%) degrees, in South Lebanon (44.1% vs. 17.7%), who found the access to OPL e-library (40.2%) and OPL LMS platform (34.9%), and who had the OPL mobile application (87.3% vs. 60.7%), were found among enrolled compared to those who were not enrolled. Finally, there were more pharmacists aware of the number of credits to be completed by December 2019 and of the number of credits they earned so far among pharmacists enrolled in the CE program compared with those who did not (34.4% vs. 4.9% and 37.4% vs. 6.6%), respectively (Table 3).

The bivariate analysis of factors associated with taking online CE credits showed that significantly higher means general confidence with computer use (38.38 vs. 34.86), number of working days per week (6.50 vs. 5.98) and number of working hours per day (12.33 vs. 10.46) were found in pharmacists taking online CEs compared to those who were not. In addition, significantly lower mean age (35.02 vs. 39.27) and mean number of years practicing pharmacy (9.54 vs. 13.53) were found in pharmacists taking online CEs compared to those who were not. Moreover, a significantly higher percentage of pharmacists with a Pharm.D. degree, graduating from outside Lebanon, working in South Lebanon, finding the access to the OPL e-library easy, and less aware of the number of CE credits earned so far, took online CEs among those who took online CEs. Finally, a significantly higher percentage of male pharmacists were found among pharmacist took online CEs compared to those who did not (61.8% vs. 31.5%) (Table 3).

Table 3. Bivariate analysis of factors associated with taking vs. not taking online CE mainly, taking vs. not taking live CE mainly and those enrolling or not in CE in general.

		Did not take online CE N=594 (94.6%)	Took online CE N=34 (5.4%)	p-value	Did not take live CE N=531 (84.6%)	Took live CE N=97 (15.4%)	p-value	Did not enroll in CE N=61 (9.7%)	Enrolled in CE N=567 (90.3%)	p-value
Value		14.25 ± 3.40	13.70 ± 3.39	0.364	14.22 ± 3.38	14.20 ± 3.49	0.962	12.90 ± 4.54	14.36 ± 3.22	**0.001**
Motivation		31.28 ± 6.18	31.50 ± 4.19	0.840	31.15 ± 6.25	32.05 ± 5.05	0.183	29.04 ± 9.36	31.53 ± 5.58	**0.046**
Computer literacy		34.86 ± 5.64	38.38 ± 5.65	**<0.001**	35.02 ± 5.78	35.19 ± 5.19	0.790	34.62 ± 5.59	35.10 ± 5.70	0.534
Age (in years)		39.27 ± 10.68	35.02 ± 7.36	**0.003**	39.74 ± 10.72	35.21 ± 8.78	**<0.001**	35.23 ± 9.33	35.02 ± 7.36	0.914
Number of years of practicing pharmacy		13.53 ± 9.50	9.54 ± 6.88	**0.003**	13.93 ± 9.62	9.93 ± 7.41	**<0.001**	10.09 ± 8.81	9.54 ± 6.88	0.758
Number of working days per week		5.98 ± 1.12	6.50 ± 0.66	**0.008**	6.03 ± 1.05	5.87 ± 1.37	0.272	6.16 ± 1.11	6.50 ± 0.66	0.114
Number of working hours per day		10.46 ± 5.82	12.33 ± 8.85	0.079	10.70 ± 6.20	9.84 ± 4.98	0.197	10.98 ± 5.99	12.33 ± 8.85	0.404
Educational level	Bachelor Science Pharmacy	31 (50.8%)	227 (40%)	**0.036**	206 (38.8%)	52 (53.6%)	**0.016**	31 (50.8%)	227 (40%)	**0.036**
	Pharmacy Doctor	15 (24.6%)	234 (41.3%)		224 (42.2%)	25 (25.8%)		15 (24.6%)	234 (41.3%)	
	Masters' degree	14 (23%)	84 (14.8%)		81 (15.3%)	17 (17.5%)		14 (23%)	84 (14.8%)	
	Philosophy Doctor	1 (1.6%)	22 (3.9%)		20 (3.8%)	3 (3.1%)		1 (1.6%)	22 (3.9%)	
University you graduated from	Lebanese University	112 (18.9%)	3 (8.8%)	**0.007**	105 (19.8%)	10 (10.3%)	**0.003**	8 (13.1%)	107 (18.9%)	0.07
	Saint Joseph University	146 (24.6%)	1 (2.9%)		134 (25.3%)	13 (13.4%)		8 (13.1%)	139 (24.6%)	
	Beirut Arab University	85 (14.3%)	4 (11.8%)		74 (14%)	15 (15.5%)		10 (16.4%)	79 (14%)	
	Lebanese American University	50 (8.4%)	5 (14.7%)		44 (8.3%)	11 (11.3%)		11 (18%)	44 (7.8%)	
	Lebanese International University	56 (9.4%)	5 (14.7%)		44 (8.3%)	17 (17.5%)		7 (11.5%)	54 (9.5%)	
	American University of Beirut	3 (0.5%)	0 (0%)		3 (0.6%)	0 (0%)		0 (0%)	3 (0.5%)	
	Outside Lebanon	141 (23.8%)	16 (47.1%)		126 (23.8%)	31 (32%)		17 (27.9%)	140 (24.7%)	
Work location	Not working yet	19 (3.2%)	0 (0%)	**0.003**	14 (2.6%)	5 (5.2%)	0.066	19 (3.2%)	0 (0%)	**0.003**
	Beirut	89 (15%)	3 (8.8%)		71 (13.4%)	21 (21.6%)		89 (15%)	3 (8.8%)	
	Mount Lebanon	250 (42.1%)	8 (23.5%)		229 (43.1%)	29 (29.9%)		250 (42.1%)	8 (23.5%)	
	North Lebanon	20 (3.4%)	0 (0%)		18 (3.4%)	2 (2.1%)		20 (3.4%)	0 (0%)	
	South Lebanon	105 (17.7%)	15 (44.1%)		102 (19.2%)	18 (18.6%)		105 (17.7%)	15 (44.1%)	
	Bekaa	111 (18.7%)	8 (23.5%)		97 (18.3%)	22 (22.7%)		111 (18.7%)	8 (23.5%)	

Table 3 (Cont.). Bivariate analysis of factors associated with taking vs. not taking online CE mainly, taking vs. not taking live CE mainly and those enrolling or not in CE in general.

		Did not take online CE N=594 (94.6%)	Took online CE N=34 (5.4%)	p-value	Did not take live CE N=531 (84.6%)	Took live CE N=97 (15.4%)	p-value	Did not enroll in CE N=61 (9.7%)	Enrolled in CE N=567 (90.3%)	p-value
Sector of work	Not working yet	18 (3%)	0 (0%)	0.506	13 (2.5%)	5 (5.2%)	0.188	2 (3.3%)	16 (2.8%)	0.188
	Community pharmacy employer	365 (61.6%)	26 (76.5%)		342 (64.5%)	49 (50.5%)		38 (62.3%)	353 (62.4%)	
	Community pharmacy employee	115 (19.4%)	7 (20.6%)		101 (19.1%)	21 (21.6%)		18 (29.5%)	104 (18.4%)	
	Hospital/clinical	27 (4.6%)	1 (2.9%)		24 (4.5%)	4 (4.1%)		0 (0%)	28 (4.9%)	
	Scientific office/medical representative	37 (6.2%)	0 (0%)		27 (5.1%)	10 (10.3%)		3 (4.9%)	34 (6%)	
	Academia	11 (1.9%)	0 (0%)		6 (1.1%)	5 (5.2%)		0 (0%)	11 (1.9%)	
	Public sector (MOPH)	14 (2.4%)	0 (0%)		13 (2.5%)	1 (1%)		0 (0%)	14 (2.5%)	
	Industry	6 (1%)	0 (0%)		4 (0.8%)	2 (2.1%)		0 (0%)	6 (1.1%)	
Connected to the internet for at least 4 hours per day	No	48 (8.1%)	6 (17.6%)	0.151	72 (13.6%)	7 (7.2%)	0.083	3 (4.9%)	51 (9%)	0.130
	Yes	522 (87.9%)	27 (79.4%)		459 (86.4%)	90 (92.8%)		53 (86.9%)	496 (87.5%)	
	As needed	24 (4%)	1 (2.9%)		0 (0%)	0 (0%)		5 (8.2%)	20 (3.5%)	
Ease to access OPL e-library account	Never tried	24 (39.3%)	46 (8.1%)	**<0.001**	47 (8.9%)	23 (23.7%)	**<0.001**	24 (39.3%)	46 (8.1%)	**<0.001**
	Easy	14 (23%)	228 (40.2%)		230 (43.3%)	12 (12.4%)		14 (23%)	228 (40.2%)	
	Intermediate	7 (11.5%)	204 (36%)		181 (34.1%)	30 (30.9%)		7 (11.5%)	204 (36%)	
	Difficult	16 (26.2%)	89 (15.7%)		73 (13.7%)	32 (33%)		16 (26.2%)	89 (15.7%)	
Ease to access OPL LMS platform	Never tried	88 (14.8%)	6 (17.6%)	0.150	63 (11.9%)	31 (32%)	**<0.001**	33 (54.1%)	61 (10.8%)	**<0.001**
	Easy	200 (33.7%)	5 (14.7%)		196 (36.9%)	9 (9.3%)		7 (11.5%)	198 (34.9%)	
	Intermediate	201 (33.8%)	15 (44.1%)		194 (36.5%)	22 (22.7%)		7 (11.5%)	209 (36.9%)	
	Difficult	105 (17.7%)	8 (23.5%)		78 (14.7%)	35 (36.1%)		14 (23%)	99 (17.5%)	
Gender	Male	187 (31.5%)	21 (61.8%)	**<0.001**	178 (33.5%)	30 (30.9%)	0.618	26 (42.6%)	182 (32.1%)	0.097
	Female	407 (68.5%)	13 (38.2%)		353 (66.5%)	67 (69.1%)		35 (57.4%)	385 (67.9%)	
OPL mobile application	No	91 (15.3%)	5 (14.7%)	0.923	77 (14.5%)	19 (19.6%)	0.200	24 (39.3%)	72 (12.7%)	**<0.001**
	Yes	503 (84.7%)	29 (85.3%)		454 (85.5%)	78 (80.4%)		37 (60.7%)	495 (87.3%)	
Read OPL messages	No	24 (4%)	3 (8.8%)	0.171	22 (4.1%)	5 (5.2%)	0.871	5 (8.2%)	22 (3.9%)	0.084
	Yes	491 (82.7%)	24 (70.6%)		437 (82.3%)	78 (80.4%)		44 (72.1%)	471 (83.1%)	
	Sometimes	79 (13.3%)	7 (20.6%)		72 (13.6%)	14 (14.4%)		12 (19.7%)	74 (13.1%)	
Know number of credits to be completed by December 2019	No	288 (48.5%)	23 (67.6%)	0.094	239 (45%)	72 (74.2%)	**<0.001**	53 (86.9%)	258 (45.5%)	**<0.001**
	Yes	191 (32.2%)	7 (20.6%)		184 (34.7%)	14 (14.4%)		3 (4.9%)	195 (34.4%)	
	More or less	115 (19.4%)	4 (11.8%)		108 (20.3%)	11 (11.3%)		5 (8.2%)	114 (20.1%)	
Aware of the number of CE credits earned so far	No	268 (45.1%)	26 (76.5%)	**0.002**	221 (41.6%)	73 (75.3%)	**<0.001**	53 (86.9%)	241 (42.5%)	**<0.001**
	Yes	210 (35.4%)	6 (17.6%)		201 (37.9%)	15 (15.5%)		4 (6.6%)	212 (37.4%)	
	More or less	116 (19.5%)	2 (5.9%)		109 (20.5%)	9 (9.3%)		4 (6.6%)	11 (20.1%)	

Table 4. Multivariable analysis: multinomial logistic regression

Model 1: Comparing participants taking live CEs versus no CEs as the dependent variable.	**p-value**	**aOR**	**95%CI**	
Motivation score	0.080	1.05	0.994	1.109
Value score	0.176	1.076	0.968	1.197
Model 2: Comparing participants taking online CEs versus no CEs as the dependent variable.	**p-value**	**aOR**	**95%CI**	
Motivation score	0.072	1.070	0.994	1.152
Model 3: Comparing participants who enrolled vs. those who did not in CE program.	**p-value**	**ORa**	**95%CI**	
Value score	0.105	1.087	0.983	1.203
Motivation score	0.030	1.059	1.006	1.114
General confidence with computer use (Fogarty score)	0.013	1.058	1.012	1.106

The bivariate analysis of factors associated with taking live CE credits or not, showed that significantly higher mean age (39.74 vs. 35.21) and number of years of practicing pharmacy (13.93 vs. 9.93) were found in pharmacists who did not take live CEs compared to those who did. Among those who took live CEs compared to those who did not, we found a higher percentage of pharmacists with a BS Pharmacy (53.6% vs. 38.8%), who graduated from LIU (17.5% vs. 8.3%), who never tried the OPL e-library account (32% vs. 11.9%), who do not own a computer (23.7% vs. 12.3%), who did not know the number of credits to be completed by December 2019 (74.2% vs. 45%) and who were aware of the number of credits they earned so far (75.3% vs. 41.6%) (Table 3).

Multivariable analysis

The results of the multinomial logistic regression analyses are shown in Table 4. A first logistic regression, comparing participants taking live CEs only versus no CEs as the dependent variable, showed that higher motivation to CE (aOR=1.05) and higher value of CE (aOR=1.076) were associated with higher odds of doing live CEs (Table 4, Model 1). When comparing participants doing online CEs only to those who did not do any CEs, the results showed that higher motivation to CE (ORa=1.07) was associated with higher odds of doing online CEs (Table 4, Model 2). When comparing participants who do both live and online CEs versus those not doing any CEs, the results showed that higher motivation to CE (ORa=1.059) and higher general confidence with computer use (computer literacy) (ORa=1.058) were significantly associated with higher odds of doing both types of CEs (Table 4, Model 3).

DISCUSSION

In this study, we found that significantly higher value and motivation indices were associated with enrolling in the CE system. Higher motivation to do CE and higher value of CE were associated with higher odds of doing live CE. Higher motivation to do CE was associated with higher odds of doing online CE. Also, a higher motivation to do CE was significantly associated with higher odds of doing both types of CEs.

Limitations and strengths

This study has several limitations. To start with, there is an over-representation of pharmacists who have enrolled in the CE system (90.3% in the sample vs. 67% in OPL official reports): this could be explained by the fact that the majority of respondents are pharmacists interested in CE programs. However, we do not think that this would affect our results in a major way. Second, our results might be prone to self-report bias. The pharmacists subjectively self-assessed themselves in terms of computer skills; therefore, the findings might be overestimated as a result of potential social desirability bias. Furthermore, there were items that required the pharmacists to recall some historical data, thereby predisposing the findings to recall bias. Another major limitation was the participation of many interviewers in data collection, which may lead to interviewer bias. For this sake, prior training of the interviewers and the use of a single translated version of the questionnaire were applied to limit this type of bias. Not to forget the workload at some pharmacies that prevented them from filling out accurately the questionnaire, which ended up in lack of information. This study is also limited by the fact it is evaluating the early stages of applying the CE system, with the possibility that results could change with time. Therefore, to assess long-term outcomes of the program, further research needs to be undertaken to learn about sustained impact on skills and use of the Internet as a source of information for practice. Finally, a residual confounding might be possible due to the fact that some variables were not studied in this analysis.

Despite these limitations, this study is among the few studies conducted in the region to assess the effect of computer literacy, motivation for CE and value of CE among pharmacists, on enrollment in a CE program. Moreover, the survey was distributed on the six governorates of Lebanon which may increase the generalizability of the results.

Interpretation of findings

These results are similar to those reported through other studies where motivation increased participation to CE; several researchers explain these results using the self-determination theory presented by Deci & Ryan, where tendency to grow is a natural process of human beings; it finds its roots in intrinsic and extrinsic motivation, while amotivation is a state of passive behavior, where humans are unable to accomplish required outcomes.[21,22] Moreover, studies state that learning and motivation should be well integrated to ensure that professionals maintain a positive attitude towards CE and meet their needs for current practice.[23]

A significantly higher percentage of pharmacists with a PharmD (41.3%) or PhD (3.9%) degree enrolled in the CE program compared with those who did not. This can also be explained by the self-determination theory, since people who voluntarily achieve higher degrees of education (although not officially required) are the ones who mainly

have an intrinsic autonomous motivation for all types of education, driven by the interest and joy in the task itself.[22]

Moreover, a significantly higher percentage of pharmacists who found the access to OPL e-library (40.2%) and OPL LMS platform (34.9%) easy, enrolled in the CE program compared with those who did not. In parallel, the bivariate analysis showed that a significantly higher mean of computer literacy (38.38 vs. 34.86) was found among pharmacists doing online CE credits; this result was confirmed in multivariable analysis for all types of CE, where a higher general confidence with computer use (aOR=1.058) was significantly associated with higher odds of doing both types of CEs. This finding is expected, given that using the OPL e-library requires some basic computer skills, and people with very low computer literacy would not undergo such endeavor. Furthermore, people in remote areas have difficulties to connect to the Internet since they have access only to low-speed Internet when available. Our results are similar to those of Chiu et al. in a study conducted in Taiwan in 2016 showing that internet self-efficacy was essential to in increasing self-regulated learning in online continuing education, especially among older pharmacists.[24]

Future research

Since we did not assess the factors associated with value and motivation of pharmacists to enroll in the CE program, further research is suggested focusing on the following factors to meet pharmacists' expectations: quality of instruction, quality of curriculum, relevance and pragmatism, interactive classrooms and effective management practices, progressive assessment and timely feedback, self-directedness, conducive learning environment, and effective academic advising practices. All these factors proved to be crucial according to previous studies among adult learners.[5,25] Furthermore, assessing autonomous and controlled motivation types would be essential to further increase motivation types among Lebanese Pharmacists.[26]

CONCLUSIONS

A high percentage of Lebanese pharmacists earned at least one CE credit, mainly driven by motivation and value of CE, in addition to a higher general confidence in computer use. Further efforts should be exerted by the OPL to motivate pharmacists and help them improve their computer literacy, which is expected to improve not only enrollment in CE activities, but also the completion of their CE requirements.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

FUNDING

None.

References

1. Rouse MJ. Continuing professional development in pharmacy. Am J Health Syst Pharm. 2004;61(19):2069-2076. https://doi.org/10.1093/ajhp/61.19.2069
2. International Pharmaceutical Federation – FIP (2014). Continuing Professional Development/Continuing Education in Pharmacy: Global Report. The Hague, The Netherlands: International Pharmaceutical Federation. Available at: https://www.fip.org/files/fip/PharmacyEducation/CPD_CE_report/FIP_2014_Global_Report_CPD_CE_online_version.pdf (accessed Oct 3, 2018).
3. ASHP statement on the pharmacist's role in informatics. Am J Health Syst Pharm. 2007;64(2):200-203. https://doi.org/10.2146/ajhp060364
4. Forsetlund L, Bjørndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, Davis D, Odgaard-Jensen J, Oxman AD. Continuing education meetings and workshops: effects on professional practice and health care outcomes. Cochrane Database Syst Rev. 2009;(2):CD003030. https://doi.org/10.1002/14651858.CD003030.pub2
5. Sogunro OA. Motivating factors for adult learners in higher education. Int J Higher Educ. 2014;4(1):22-37. https://doi.org/10.5430/ijhe.v4n1p22
6. Alkateeb FM, Attarabeen OF, Alameddine S. Assessment of Texan pharmacists' attitudes, behaviors, and preferences related to continuing pharmacy education. Pharm Pract (Granada). 2016;14(3):769. https://doi.org/10.18549/PharmPract.2016.03.769
7. Driesen A, Leemans L, Baert H, Laekeman G. Flemish community pharmacists' motivation and views related to continuing education. Pharm World Sci. 2005;27(6):447-452. https://doi.org/10.1007/s11096-005-0950-7
8. Wilbur K. Continuing professional pharmacy development needs assessment of Qatar pharmacists. Int J Pharm Pract. 2010;18(4):236-241. https://doi.org/10.1111/j.2042-7174.2010.00034.x
9. Institute of Medicine. Redesigning continuing education in the health professions. Washington (DC): National Academies Press (US); 2010.
10. Brown MC, Kotlyar M, Conway JM, Seifert R, St. Peter JV. Integration of an Internet-based medical chart into a pharmacotherapy lecture series. Am J Pharm Educ. 2007;71(3):53.
11. Hull H, Rutter P. A cross-sectional survey of UK community pharmacists' views on continuing education and continuing professional development. Int J Pharm Educ. 2003;1(2):12.
12. Mottram DR, Rowe P, Gangani N, Al-Khamis Y. Pharmacists' engagement in continuing education and attitudes towards continuing professional development. Pharm J. 2002;269(7221):618-622.
13. Marriott JL, Duncan GJ, Namara KPM. Barriers to pharmacist participation in continuing education in Australia. Pharm Educ. 2007;7(1):11-17.

14. Lebanese Republic. Law 190 related to the mandatory continuing education of pharmacists in Lebanon. Available through the Lebanese Order of Pharmacisits' website. http://opl.org.lb/newdesign/lawsandregulations.php . (accessed Oct 3, 2018).
15. Lebanese Order of Pharmacists website. Available at: http://Www.Opl.Org.Lb (accessed Oct 4, 2018).
16. Dib JG, Saade S, Merhi F. Pharmacy practice in Lebanon. Am J Health Syst Pharm. 2004 Apr 15;61(8):794-795. https://doi.org/10.1093/ajhp/61.8.794
17. Lebanese Order of Pharmacsits. Learning Management System. Available at: https://swankhealth.ae/default.aspx (accessed Oct 4, 2018).
18. Fogarty G, Cretchley P, Harman C, Ellerton N, Konki N. Validation of a questionnaire to measure mathematics confidence, computer confidence, and attitudes towards the use of technology for learning mathematics. Math Educ Res J. 2001;13(2):154-160. https://doi.org/10.1007/BF03217104
19. Young AM. A prescription for reframing continuing pharmacy education in Massachusetts, Northeastern University; 2012.
20. Lumley T, Diehr P, Emerson S, Chen L. The importance of the normality assumption in large public health data sets. Annu Rev Public Health. 2002;23:151-169. https://doi.org/10.1146/annurev.publhealth.23.100901.140546
21. Tsoi STA. The Role of Motivation in Continuing Education for Pharmacists, University Utrecht; 2017.
22. Deci EL, Ryan RM. Handbook of self-determination research. University Rochester Press; 2002.
23. McCombs BL. Motivation and lifelong learning. Educ Psychol. 1991;26(2):117-127.
24. Chiu YL, Liang JC, Mao PCM, Tsai CC. Improving Health Care Providers' Capacity for Self-Regulated Learning in Online Continuing Pharmacy Education: The Role of Internet Self-Efficacy. J Contin Educ Health Prof. 2016;36(2):89-95. https://doi.org/10.1097/CEH.0000000000000066
25. Namara KPM, Duncan GJ, McDowell J, Marriott JL. Community pharmacists' preferences for continuing education delivery in Australia. J Contin Educ Health Prof. 2009;29(1):52-57. https://doi.org/10.1002/chp.20006
26. Gelayee DA, Mekonnen GB, Birarra MK. Involvement of community pharmacists in continuing professional development (CPD): a baseline survey in Gondar, Northwest Ethiopia. Global Health. 2018;14(1):15. https://doi.org/10.1186/s12992-018-0334-0

Original Research

Potentially inappropriate medications prescribing according to Beers criteria among elderly outpatients in Jordan: a cross sectional study

Ahmad AL-AZAYZIH, Rawan ALAMOORI, Shoroq M. ALTAWALBEH.
Received (first version): 28-Dec-2018 Accepted: 26-May-2019 Published online: 5-Jun-2019

Abstract

Background: Due to aging, along with its associated physiological changes, older adults are extremely vulnerable to be afflicted with multiple chronic conditions (multimorbidity). Accordingly, prescribing a large number of drugs to older adults would be inevitable. Resulted complex drug regimens can lead to prescribing of Potentially Inappropriate Medications (PIMs) with subsequent negative health and economic outcomes.

Objectives: The main objective of this study is to investigate the prevalence and predictors of PIMs prescribing among Jordanian elderly outpatients, using the last updated version of the American Geriatrics Society (AGS) Beers Criteria (2015 version).

Methods: A Unicenter, cross-sectional study were data was assessed using medical records of included study subjects conducted over three months period from beginning of October to the end of December 2016 at King Abdullah University Hospital, Al Ramtha, Jordan. Our study included patients aged 65 years or above who visited the outpatient clinics at King Abdullah University hospital (KAUH) and were prescribed at least one oral medication during the study period. PIMs were identified for these patients and further classified according to the 2015 AGS Beers Criteria. We measured the prevalence of PIMs prescribed among elderly outpatients in Jordan.

Results: A total of 4622 eligible older adults were evaluated in this study, of whom 62.5% (n=2891) were found to have at least one PIM prescribed during the three months study period. 69% of identified PIMs were medications to be used with caution in elderly, 22% were medications to avoid in many or most older adults, 6.3% were medications to be avoided or have their dosage adjusted based on kidney function in older adults, 2.04% medications were to avoid in older adults with specific diseases/syndromes, and 1.6% were potentially clinically important non-anti-infective drug-drug interactions to be avoided in older adults. Female gender and polypharmacy were found to be significant predictors of PIMs use among elderly.

Conclusions: Potentially Inappropriate Medication prescribing is common among Jordanian elderly outpatients. Female gender and polypharmacy are associated with more PIMs prescribing and so need further attention.

Keywords

Potentially Inappropriate Medication List; Inappropriate Prescribing; Polypharmacy; Aged; Outpatients; Risk Factors; Pharmacists; Cross-Sectional Studies; Jordan

INTRODUCTION

Potentially inappropriate medications (PIMs) among elderly is defined as "medications or medication classes which generally should be avoided in patients aged 65 years or older because of being either ineffective or pose potential high risk for such age group while safer alternatives are available".[1] PIMs use, where adverse effects exceed its health benefits, is a highly witnessed issue among older adults ranging from a prevalence of 11.5 - 85.1% among community dwelling and hospitalized elderly patients in various countries.[2-14] Data from numerous studies performed at various settings revealed PIM prescribing with prevalence of up to 40% in nursing home residents and up to 28% among community-based older patients.[15-23] Healthcare utilization, including: hospitalizations, healthcare visits (Inpatient, Outpatient and Emergency Department), re-admissions and length of stays, was shown to be significantly associated with PIM use among elderly patients.[24]

Detecting adverse drug reactions among geriatric patients is challenging, as they often exhibit non-specific symptoms such as constipation, lethargy, lightheadedness, confusion, falls and depression.[25] Nonetheless, adverse drug reaction rates among elderly patients are at least three-times that of the younger as well as general population.[25] Several studies performed in order to investigate the association between PIMs use and developing unwanted Adverse Drug Reactions (ADRs) and Adverse Drug Events (ADEs) among elderly patients at different settings (hospitalized, outpatient and even nursing home residents) concluded that using PIMs is significantly associated with an increased risk of developing ADRs and ADEs.[26-28]

Screening tools for PIMs use have been developed over the past two decades, with the latest updated version of the Beers Criteria was released by the American Geriatrics Society (AGS) in October, 2015.[29] In addition to updating existing criteria (i.e., 2012), the 2015 version has come up with two new major aspects: 1) Drugs for which dosage adjustment is required based on the patient's kidney function, and 2) Drug-Drug Interactions (DDIs).[29] The goal of the 2015 update of AGS Beers Criteria continues to be improving geriatric care by reducing their exposure to PIMs. Prudent application of the criteria as a non-punitive

Ahmad AL-AZAYZIH. Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology. Irbid, (Jordan). aaazayzih@just.edu.jo
Rawan ALAMOORI. Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology. Irbid, (Jordan). rammouri53@gmail.com
Shoroq M. ALTAWALBEH. Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology. Irbid, (Jordan). smaltawalbeh@just.edu.jo

educational tool and quality improvement measure is intended to achieve a closer monitoring of medication usage among older adults.[29]

Overall, PIM use among geriatric patients has become a global concern, and studies were conducted in many countries using globally developed tools for screening this phenomenon.[2,30-32] However, no study has yet systemically examined PIMs prescribing among Jordanian elderly patients. Accordingly, this study is aiming to investigate the prevalence and predictors of PIM prescribing among Jordanian elderly outpatients, using the last updated version of the American Geriatrics Society (AGS) 2015 Beers Criteria. The main objective of this study is to investigate the prevalence and predictors of PIMs prescribing among Jordanian elderly outpatients, using the last updated version of the American Geriatrics Society (AGS) Beers Criteria (2015 version).

METHODS

Ethics Approval

This study was approved by the Institutional Review Board (IRB) of King Abdullah University Hospital (KAUH). (Approval Number: 16/100/2016)

Study design and population

This study was a cross-sectional study where data was assessed using medical records of included study subjects. In this study, patients aged 65 years and older who visited the King Abdulla University Hospital (KAUH) located at Al-Ramtha, Jordan, and were ordered at least one outpatient prescription containing at least one prescribed medication during the period from October 1, 2016 to December 31, 2016 were identified as the study population. Electronic outpatient medical records were reviewed and data including demographics and clinical characteristics including age, gender, comorbidities related to AGS Beers Criteria, medications prescribed, and the latest measured serum Creatinine level were extracted. Latest measured serum creatinine level for each patient was used to calculate creatinine clearance using Jelliffe equation, which could be used and reasonably accurate when height and weight are not available in average-sized patients.[33] Polypharmacy was investigated and defined as simultaneous use of five or more different prescribed medications.[34]

Primary outcomes

Potentially Inappropriate Medications (PIMs) among participants were identified and further classified according to the 2015 American Geriatrics Society (AGS) Beers Criteria in the following classes:[29]

1) Medications to avoid in many or most geriatrics (Class I). Prescribing any of the listed medications among the study population was considered as a PIM.
2) Medications to avoid in older adults with certain diseases/syndromes (Class II). Drug-disease interactions were evaluated for each patient who was ordered any of the listed medications. All related conditions/diseases have been investigated and confirmed for those patients using their medical records. Subsequently, patients exposed to PIM were

Table 1. Potentially inappropriate medications to avoid in many or most older adults (22% of total PIMs)

Class/Medication	% of total	QOE	SOR
Pain medications	31.2		
Orphenadrine		Moderate	Strong
Non-COX-Selective NSAIDs		Moderate	Strong
Gastrointestinal	25.3		
PPIs		High	Strong
Metoclopramide		Moderate	Strong
Antispasmodics	13.5		
Clidinium-Chlordiazepoxide		Moderate	Strong
Scopolamine (Hyoscine butylbromide)		Moderate	Strong
Endocrine	10.8		
Glyburide (Glibenclamide)		High	Strong
Estrogens with or without progestins		High	Strong
Central Nervous System (CNS)	9.8		
Benzodiazepines		Moderate	Strong
Antidepressants		High	Strong
Antipsychotics		Moderate	Strong
Cardiovascular	5.4		
Digoxin		Moderate	Strong
Central alpha blockers (Methyldopa)		Low	Strong
Amiodarone		High	Strong
Nifedipine, IR		High	Strong
Peripheral alpha blockers (Doxazosin)		Moderate	Strong
Anticholinergics (1st generation antihistamines)	2.6		
Chlorpheniramine		Moderate	Strong
Meclizine		Moderate	Strong
Antithrombotics	1.2		
Dipyridamole, SA		Moderate	Strong
Genitourinary	0.15		
Desmopressin		Moderate	Strong

Non-COX-Selective NSAIDs: non-cyclooxygenase selective non-steroidal anti-inflammatory drugs, PPIs: Proton Pump Inhibitors, QOE: Quality of Evidence, SOR: Strength of Recommendation

Table 2. Medications to avoid for older adults with specific diseases or syndromes (2.04% of total PIMs)

Object System/Disease	Interacting class/Medication	% of total	QOE	SOR
Central Nervous System (CNS)	–	81.3	–	–
History of falls or fractures	Anticonvulsants	–	Moderate	Strong
	Antipsychotics	–	Moderate	Strong
	Benzodiazepines	–	Moderate	Strong
	TCAs	–	Moderate	Strong
	SSRIs	–	Moderate	Strong
Dementia or cognitive impairment	Anticholinergics	–	Moderate	Strong
	Benzodiazepines	–	Moderate	Strong
	Antipsychotics	–	Moderate	Strong
Chronic seizures or epilepsy	Tramadol	–	Low	Strong
Insomnia	Theophylline	–	Moderate	Strong
Kidney and Urinary tract		10.6		
Lower Urinary Tract Symptoms, BPH	Anticholinergics (Strong)	–	Moderate	Strong
Cardiovascular		8.1		
Heart failure	NSAIDs	–	Moderate	Strong
Syncope	Anticholinergics	–	Moderate	Strong

TCAs: Tri-Cyclic Antidepressants, SSRIs: Selective Serotonin Reuptake Inhibitors, BPH: Benign Prostatic Hyperplasia, NSAIDs: Non-steroidal Anti-inflammatory Drugs, QOE: Quality of Evidence, SOR: Strength of Recommendation

then highlighted based on related recommendation. (e.g., patients ordered the oral decongestant pseudoephedrine were evaluated for the presence of insomnia; if such drug-disease interaction was confirmed then the patient was considered to have been exposed to a PIM).

3) Medications that should be used with caution among elderly patients (Class III). Prescribing any of the listed medications among the study population was considered as a PIM.

4) Potentially clinically important non-anti-infective drug-drug interactions (Class IV). Interacted medications were identified and highlighted for each subject.

5) Medications to avoid or their dosage should be adjusted based on patient kidney function (Class V). Using at least one of the listed medications along with patient creatinine clearance below indicated thresholds was considered as a PIM (e.g. patient with creatinine clearance <30ml/min and was concurrently prescribed enoxaparin was considered to have a PIM).

6) Medications belong to more than one class of the above were counted as more than one PIMs (for example, if a drug belong to class I and II, it will be considered as two PIMs)

The quality of evidence (QOE) and strength of recommendation (SOR) for each encountered Beers PIM or criterion were also reported according to The Grades of Recommendation, Assessment, Development and Evaluation (GRADE: "a common, sensible and transparent approach to grading quality or certainty of an evidence as well as strength of recommendation).[35]

Statistical analysis

Descriptive statistics, such as percentages and arithmetic means, were used to describe patient characteristics and to estimate the prevalence of PIM use among studied population. Multivariable logistic regression model was conducted to investigate potential risk factors associated with PIM use. P value of less than 0.05 was considered statistically significant. All analyses were conducted using Stata v14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

RESULTS

Eligible 4,622 geriatric patients were included in the study. Mean age (standard deviation) of studied population was 73.2 (SD 6.3) years, and 50.6 % (n=2340) of subjects were females. After excluding over the counter products, 4,356

Table 3. Medications to be used with caution in older adults (69% of total PIMs)

Class/Medication	% of total	QOE	SOR
Diuretics	45.1	Moderate	Strong
Aspirin for primary prevention of cardiac events	38.8	Low	Strong
Vasodilators	12.3	Moderate	Weak
Antidepressants	1.7		
SSRIs*	–	Moderate	Strong
TCAs*	–	Moderate	Strong
SNRIs*	–	Moderate	Strong
Antipsychotics	1.1	Moderate	Strong
Carbamazepine	0.63	Moderate	Strong
Chemotherapy	0.19		
Carboplatin	–	Moderate	Strong
Cyclophosphamide	–	Moderate	Strong
Cisplatin		Moderate	Strong
Vincristine	–	Moderate	Strong

SSRIs: Selective Serotonin Reuptake Inhibitors, TCAs: Tri-cyclic Antidepressants, SNRIs: Serotonin-Norepinephrine Reuptake Inhibitors, QOE: Quality of Evidence, SOR: Strength of Recommendation

Table 4. Potential clinically important drug-drug interactions in older adults (1.6% of total PIMs)

Object Drug/Class	Interacting Drug/Class	% of total	QOE	SOR
Anticholinergic	Anticholinergic	91.5	Moderate	Strong
CNS-active drug*	≥ 2 other CNS-active drugs	4.3	High	Strong
ACEIs	Amiloride	2.1	Moderate	Strong
Peripheral Alpha-1 blockers	Loop diuretics	1.1	Moderate	Strong
Corticosteroids, oral or parenteral	NSAIDs	1.1	Moderate	Strong

CNS-active drugs: SSRIs, TCAs, Antipsychotics, Benzodiazepines, Opioids, ACEIs: Angiotensin-Converting Enzyme Inhibitors, NSAIDs: non-steroidal anti-inflammatory drugs

patients were found to be prescribed at least one medication, with average of 5.6 (SD 3.9) prescribed medications per patient. Overall, 53.7% of women and 51.7% of men aged 65 years and older were ordered at least five prescription medications (i.e. exposed to "polypharmacy").

Of the total geriatric sample evaluated, 2891 subjects (62.5%) were prescribed at least one PIM according to 2015 Beers Criteria. The majority of these subjects were prescribed one (39.6%) or two (23.3%) PIMs, however, prescribing of three (15.8%) or four (7.6%) PIMs were also not uncommon. Of the identified PIMs, 69% were medications to be used with caution in older adults (class III), whereas 22% were medications to avoid in many or most older adults (class I), 6.3% were medications to avoid or their dosage should be adjusted based on the kidney function (class V), 2.1% were medications to avoid for older adults with specific diseases/syndromes (class II), and 1.6% were potentially clinically important non-anti-infective drug-drug interactions (class IV).

Most commonly prescribed medication classes considered as PIMs to avoid in majority of elderly patients were pain medications (31.2%), followed by gastrointestinal medications (25.3%) and antispasmodics (13.5%), Table 1.

Potential drug-disease/syndrome interactions were 2.04% of total identified PIMs. Subjects diagnosed with Central Nervous System (CNS)-related conditions (including history of falls or fractures, dementia, chronic seizures or epilepsy and insomnia) were most commonly prescribed PIMs (81.3%) in this class, Table 2.

The majority (69%) of total PIMs prescribed were medication classes to be used with caution among elderly. Diuretics (45.1%), aspirin for primary prevention of cardiac events among older adults aged ≥80 years (38.8%) and vasodilators (12.3%) were most commonly prescribed PIMs in this class, Table 3.

Only (1.6%) of total prescribed PIMs were due to drug-drug interactions (the 1st newly added component by the 2015 AGS Beers Criteria). Almost (91.5%) of detected interactions resulted from the simultaneous prescribing of at least two different medications with anticholinergic properties including first generation antihistamines (chorpheniramine and triprolidine), antimuscarinic (oxybutynin), antispasmodics (clidinium-chlordiazepoxide and hyoscyamine), Table 4.

Drugs to be avoided or have their dosage adjusted based on varying levels of kidney function in older adults (the 2nd newly added component by the 2015 AGS Beers Criteria) have contributed to almost 6.3% of total PIMs encountered. Prescribing gabapentin when CrCl <60 ml/min was responsible for the majority of PIMs in this class, Table 5.

Having at least one identified PIM was significantly associated with female gender (adjusted OR: 1.33, 95% CI: 1.14-1.55) and polypharmacy (adjusted OR: 28.39, 95%CI: 23.83-33.81), Table 6.

DISCUSSION

To the best of our knowledge, this is the first study examining PIM prevalence using Beers Criteria as a screening tool among geriatric patients in Jordan. Moreover, it considered the first study investigating and presenting the 2015 AGS Beers Criteria PIM classes in details among elderly outpatients.

Results from this study showed a high prevalence of PIM prescribing among Jordanian elderly outpatients (62.5%) according to the most updated version of the AGS Beers Criteria (2015). Female gender and polypharmacy were identified as significant predictors of PIM prescribing in this population. Previous iterations of Beers Criteria were used by a wide variety of studies examining the prevalence of PIM prescribing among older adults at various populations and settings with estimated ranges between 11.5% and 85.1%.[2,4-14,36,37] A good number of these studies have assessed prevalence of PIM prescribing based on Beers Criteria (mostly 2012 update) among community-dwelling elderly patients (outpatients) with total prevalence ranges between (23% and 81%).[4,7,8,11,13,38] The updated AGS Beers Criteria were released in 2015 and so still less thoroughly used in the available literature. In the United States, a study was conducted using Medicare Current Beneficiary Survey (MCBS) data set to identify PIMs according to 2015 AGS Beers Criteria.[29] Findings from this study showed that around 57% of older adults with dental care visits were

Table 5. Drugs to be avoided or have their dosage adjusted with varying levels of kidney function in older adults (6.3% of total PIMs)

Medication	CrCl (ml/min)	Action Required	QOE	SOR	% of total
Gabapentin	<60	Reduce dose	Moderate	Strong	71.7
Levetiracetam	≤80	Reduce dose	Moderate	Strong	13.9
Ranitidine	<50	Reduce dose	Moderate	Strong	5
Pregabalin	<60	Reduce dose	Moderate	Strong	5
Famotidine	<50	Reduce dose	Moderate	Strong	4.5

CrCl: Creatinine Clearance (ml/min), QOE: Quality of Evidence, SOR: Strength of Recommendation

Table 6. Predictors of potentially inappropriate medications prescribing among elderly patients.

Variable	OR (95% CI)	P-value
Age	0.99 (0.98-1.0)	0.14
Gender (Female)	1.33(1.14-1.55)	*<0.001
Polypharmacy #	28.39 (28.83-33.81)	*<0.001

*p-value is significant at <0.05
#: Polypharmacy was defined as ≥ 5 prescribed medications
CI, confidence interval; OR, odds ratio; PIM, potentially inappropriate medication

prescribed at least one Beers Criteria medication.[39] Another study conducted in Brazil found that 50% of community-dwelling elderly patients were prescribed at least one PIM according to the 2015 update of AGS Beers Criteria.[40] Accordingly, PIM prevalence in the current study (62.5%) is relatively comparable with available literature which investigated geriatric PIMs using the updated Beers Criteria in the outpatient settings. Nevertheless, it is an apparently high prevalence in Jordan. The vast majority of PIMs identified in the current study were drugs to be used with caution (69%). This finding is consistent with recent study in Qatar where 65% of PIMs were drugs to be used with caution.[12]

Female gender was significantly associated with PIM use. This finding is consistent with various published studies.[8,13,39] Females generally are at higher risk for developing multiple chronic conditions than males, consequently being more susceptible for drug-disease and drug-drug interactions which will lead to more inappropriate prescribing.[34,41] Polypharmacy is consistently shown to be a significant risk factor of PIM use.[8,13,42,43] Polypharmacy was the most significant predictor of PIM prescribing in the current study. Increasing age was reported by some studies as a significant risk factor of PIM use.[4,5,8] However, others have found no association between age and PIM use.[44] In the current study, age was not a significant predictor of PIM use after adjusting for polypharmacy and gender. The effect of age on PIM prescribing in older adults may be mediated by the multi-comorbidity and the resultant polypharmacy in this population.

This study has some limitations. As this was a retrospective study, all data were obtained from patient medical records and were as accurate as available documentation. Due to the large study sample, some patients' characteristics (for example, patients' weight and height) and clinical indicators were not extracted and so their association with PIM prescribing was not evaluated in this study. Similarly, complete comorbidity profiles were not obtained for all patients, however, all conditions related to PIMs were carefully evaluated for the relevant patients. In addition, because of the retrospective nature of the study, we were not able to capture the dose reduction if happened; however, we considered all those on regular maintenance dose with varying kidney functions to have potential inappropriate use. This was challenging since Beers criteria did not provide a cut off dose for these meds to be considered as PIMs. Finally, all identified PIMs are not conclusive without the clinical judgment, the criteria serve only as a warning light to raise attention to clinical evaluation that further assess risks and benefits associated with these PIMs. Overall, this study has the strength of evaluating a large number of elderly patients, enabling generalizability and reliability of findings. In addition, this is the first study-examining trend of prescribing among elderly patients in Jordan using the most updated version of Beers Criteria (2015) for PIMs identification.

CONCLUSIONS

This study demonstrates that PIM prescribing is common among Jordanian elderly outpatients. Female patients and those with polypharmacy are the most vulnerable groups that need further attention. Strategies to monitor, review, and prevent inappropriate prescribing should be supported.

CONFLICT OF INTEREST

The authors declare no conflict of interest does exist.

FUNDING

This work was funded by the Jordan University of Science and Technology – Deanship of Research. The results and contents of this work are solely the responsibility of the authors. The funders had no role in study design, data collection and analysis, and decision to publish.

References

1. Beers MH, Ouslander JG, Rollingher I, Reuben DB, Brooks J, Beck JC. Explicit criteria for determining inappropriate medication use in nursing home residents. UCLA Division of Geriatric Medicine. Arch Intern Med. 1991;151(9):1825-1832. https://doi.org/10.1001/archinte.1991.00400090107019
2. Guaraldo L, Cano FG, Damasceno GS, Rozenfeld S. Inappropriate medication use among the elderly: a systematic review of administrative databases. BMC Geriatr. 2011;11:79. https://doi.org/10.1186/1471-2318-11-79
3. da Costa FA, Periquito C, Carneiro MC, Oliveira P, Fernandes AI, Cavaco-Silva P. Potentially inappropriate medications in a sample of Portuguese nursing home residents: Does the choice of screening tools matter? Int J Clin Pharm. 2016;38(5):1103-1111. https://doi.org/10.1007/s11096-016-0337-y
4. Zeenny R, Wakim S, Kuyumjian YM. Potentially inappropriate medications use in community-based aged patients: a cross-sectional study using 2012 Beers criteria. Clin Interv Aging. 2017;12:65-73. https://doi.org/10.2147/CIA.S87564
5. Li H, Pu S, Liu Q, Huang X, Kuang J, Chen L, Shen J, Cheng S, Wu T, Li R, Li Y, Mo L, Jiang W, Song Y, He J. Potentially inappropriate medications in Chinese older adults: The beers criteria compared with the screening tool of older persons' prescriptions criteria. Geriatr Gerontol Int. 2017;17(11):1951-1958. https://doi.org/10.1111/ggi.12999

6. Hudhra K, Beçi E, Petrela E, Xhafaj D, García-Caballos M, Bueno-Cavanillas A. Prevalence and factors associated with potentially inappropriate prescriptions among older patients at hospital discharge. J Eval Clin Pract. 2016;22(5):707-713. https://doi.org/10.1111/jep.12521
7. Nam YS, Han JS, Kim JY, Bae WK, Lee K. Prescription of potentially inappropriate medication in Korean older adults based on 2012 Beers Criteria: a cross-sectional population based study. BMC Geriatr. 2016;16:118. https://doi.org/10.1186/s12877-016-0285-3
8. Lim YJ, Kim HY, Choi J, Lee JS, Ahn AL, Oh EJ, Cho DY, Kweon HJ. Potentially inappropriate medications by beers criteria in older outpatients: prevalence and risk factors. Korean J Fam Med. 2016;37(6):329-333. https://doi.org/10.4082/kjfm.2016.37.6.329
9. Osei EK, Berry-Cabán CS, Haley CL, Rhodes-Pope H. Prevalence of Beers criteria medications among elderly patients in a military hospital. Gerontol Geriatr Med. 2016;2:2333721416637790. https://doi.org/10.1177/2333721416637790
10. Hudhra K, García-Caballos M, Casado-Fernandez E, Jucja B, Shabani D, Bueno-Cavanillas A. Polypharmacy and potentially inappropriate prescriptions identified by Beers and STOPP criteria in co-morbid older patients at hospital discharge. J Eval Clin Pract. 2016;22(2):189-193. https://doi.org/10.1111/jep.12452
11. Davidoff AJ, Miller GE, Sarpong EM, Yang E, Brandt N, Fick DM. Prevalence of potentially inappropriate medication use in older adults using the 2012 Beers criteria. J Am Geriatr Soc. 2015;63(3):486-500. https://doi.org/10.1111/jgs.13320
12. Alhmoud E, Khalifa S, Bahi AA. Prevalence and predictors of potentially inappropriate medications among home care elderly patients in Qatar. Int J Clin Pharm. 2015;37(5):815-821. https://doi.org/10.1007/s11096-015-0125-0
13. Baldoni Ade O, Ayres LR, Martinez EZ, Dewulf Nde L, Dos Santos V, Pereira LR. Factors associated with potentially inappropriate medications use by the elderly according to Beers criteria 2003 and 2012. Int J Clin Pharm. 2014;36(2):316-324. https://doi.org/10.1007/s11096-013-9880-y
14. Ubeda A, Ferrándiz L, Maicas N, Gomez C, Bonet M, Peris JE. Potentially inappropriate prescribing in institutionalised older patients in Spain: the STOPP-START criteria compared with the Beers criteria. Pharm Pract (Granada). 2012;10(2):83-91.
15. Aparasu RR, Mort JR. Inappropriate prescribing for the elderly: beers criteria-based review. Ann Pharmacother. 2000;34(3):338-346. https://doi.org/10.1345/aph.19006
16. Rothberg MB, Pekow PS, Liu F, Korc-Grodzicki B, Brennan MJ, Bellantonio S, Heelon M, Lindenauer PK. Potentially inappropriate medication use in hospitalized elders. J Hosp Med. 2008;3(2):91-102. https://doi.org/10.1002/jhm.290
17. Tragni E, Casula M, Pieri V, Favato G, Marcobelli A, Trotta MG, Catapano AL. Prevalence of the prescription of potentially interacting drugs. PLoS One. 2013;8(10):e78827. https://doi.org/10.1371/journal.pone.0078827
18. Barry PJ, Gallagher P, Ryan C. Inappropriate prescribing in geriatric patients. Curr Psychiatry Rep. 2008;10(1):37-43.
19. Cahir C, Fahey T, Teeling M, Teljeur C, Feely J, Bennett K. Potentially inappropriate prescribing and cost outcomes for older people: a national population study. Br J Clin Pharmacol. 2010;69(5):543-552. https://doi.org/10.1111/j.1365-2125.2010.03628.x
20. Hanlon JT, Schmader KE, Boult C, Artz MB, Gross CR, Fillenbaum GG, Ruby CM, Garrard J. Use of inappropriate prescription drugs by older people. J Am Geriatr Soc. 2002;50(1):26-34. https://doi.org/10.1046/j.1532-5415.2002.50004.x
21. Giron MS, Wang HX, Bernsten C, Thorslund M, Winblad B, Fastbom J. The appropriateness of drug use in an older nondemented and demented population. J Am Geriatr Soc. 2001;49(3):277-283. https://doi.org/10.1046/j.1532-5415.2001.4930277.x
22. Blozik E, Rapold R, von Overbeck J, Reich O. Polypharmacy and potentially inappropriate medication in the adult, community-dwelling population in Switzerland. Drugs Aging. 2013;30(7):561-568. https://doi.org/10.1007/s40266-013-0073-0
23. Galvin R, Moriarty F, Cousins G, Cahir C, Motterlini N, Bradley M, Hughes CM, Bennett K, Smith SM, Fahey T, Kenny RA. Prevalence of potentially inappropriate prescribing and prescribing omissions in older Irish adults: findings from The Irish LongituDinal Study on Ageing study (TILDA). Eur J Clin Pharmacol. 2014;70(5):599-606. https://doi.org/10.1007/s00228-014-1651-8
24. Hyttinen V, Jyrkkä J, Valtonen H. A systematic review of the impact of potentially inappropriate medication on health care utilization and costs among older adults. Med Care. 2016;54(10):950-964. https://doi.org/10.1097/MLR.0000000000000587
25. Gallagher P, Barry P, O'Mahony D. Inappropriate prescribing in the elderly. J Clin Pharm Ther. 2007;32(2):113-121. https://doi.org/10.1111/j.1365-2710.2007.00793.x
26. Chang CM, Liu PY, Yang YH, Yang YC, Wu CF, Lu FH. Use of the Beers criteria to predict adverse drug reactions among first-visit elderly outpatients. Pharmacotherapy. 2005;25(6):831-838.
27. Onder G, Landi F, Liperoti R, Fialova D, Gambassi G, Bernabei R. Impact of inappropriate drug use among hospitalized older adults. Eur J Clin Pharmacol. 2005;61(5-6):453-459. https://doi.org/10.1007/s00228-005-0928-3
28. Perri M 3rd, Menon AM, Deshpande AD, Shinde SB, Jiang R, Cooper JW, Cook CL, Griffin SC, Lorys RA. Adverse outcomes associated with inappropriate drug use in nursing homes. Ann Pharmacother. 2005;39(3):405-411. https://doi.org/10.1345/aph.1E230
29. By the American Geriatrics Society Beers Criteria Update Expert, P. (2015). American Geriatrics Society 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. J Am Geriatr Soc. 2015;63(11):2227-2246. https://doi.org/10.1111/jgs.13702
30. Hukins D, Macleod U, Boland JW. Identifying potentially inappropriate prescribing in older people with dementia: a systematic review. Eur J Clin Pharmacol. 2019;75(4):467-481. https://doi.org/10.1007/s00228-018-02612-x
31. Motter FR, Fritzen JS, Hilmer SN, Paniz ÉV, Paniz VMV. Potentially inappropriate medication in the elderly: a systematic review of validated explicit criteria. Eur J Clin Pharmacol. 2018;74(6):679-700. https://doi.org/10.1007/s00228-018-2446-0

32. Storms H, Marquet K, Aertgeerts B, Claes N. Prevalence of inappropriate medication use in residential long-term care facilities for the elderly: A systematic review. Eur J Gen Pract. 2017;23(1):69-77. https://doi.org/10.1080/13814788.2017.1288211
33. O'Connell MB, Dwinell AM, Bannick-Mohrland SD. Predictive performance of equations to estimate creatinine clearance in hospitalized elderly patients. Ann Pharmacother. 1992;26(5):627-635. https://doi.org/10.1177/106002809202600503
34. Prithviraj GK, Koroukian S, Margevicius S, Berger NA, Bagai R, Owusu C. Patient characteristics associated with polypharmacy and inappropriate prescribing of medications among older adults with cancer. J Geriatr Oncol. 2012;3(3):228-237. https://doi.org/10.1016/j.jgo.2012.02.005
35. Guyatt GH, Oxman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P, Schünemann HJ; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008;336(7650):924-926. https://doi.org/10.1136/bmj.39489.470347.AD
36. Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH. Updating the Beers criteria for potentially inappropriate medication use in older adults: results of a US consensus panel of experts. Arch Intern Med. 2003;163(22):2716-2724. https://doi.org/10.1001/archinte.163.22.2716
37. American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2012;60(4):616-631. https://doi.org/10.1111/j.1532-5415.2012.03923.x
38. Buck MD, Atreja A, Brunker CP, Jain A, Suh TT, Palmer RM, Dorr DA, Harris CM, Wilcox AB. Potentially inappropriate medication prescribing in outpatient practices: prevalence and patient characteristics based on electronic health records. Am J Geriatr Pharmacother. 2009;7(2):84-92. https://doi.org/10.1016/j.amjopharm.2009.03.001
39. Skaar DD, O'Connor H. Using the Beers criteria to identify potentially inappropriate medication use by older adult dental patients. J Am Dent Assoc. 2017;148(5):298-307. https://doi.org/10.1016/j.adaj.2017.01.020
40. Novaes PH, da Cruz DT, Lucchetti ALG, Leite ICG, Lucchetti G.Comparison of four criteria for potentially inappropriate medications in Brazilian community-dwelling older adults. Geriatr Gerontol Int. 2017;17(10):1628-1635. https://doi.org/10.1111/ggi.12944
41. Fabbri E, Zoli M, Gonzalez-Freire M, Salive ME, Studenski SA, Ferrucci L.Aging and multimorbidity: new tasks, priorities, and frontiers for integrated gerontological and clinical research. J Am Med Dir Assoc. 2015 Aug 1;16(8):640-647. https://doi.org/10.1016/j.jamda.2015.03.013
42. Charlesworth CJ, Smit E, Lee DS, Alramadhan F, Odden MC.Polypharmacy Among Adults Aged 65 Years and Older in the United States: 1988-2010. J Gerontol A Biol Sci Med Sci. 2015;70(8):989-995. https://doi.org/10.1093/gerona/glv013
43. Santos AP, da Silva DT, dos Santos Júnior GA, Silvestre CC, Nunes MA, Lyra DP Jr, Antoniolli AR. Evaluation of the heterogeneity of studies estimating the association between risk factors and the use of potentially inappropriate drug therapy for the elderly: a systematic review with meta-analysis. Eur J Clin Pharmacol. 2015;71(9):1037-1050. https://doi.org/10.1007/s00228-015-1891-2
44. Kondo N, Nakamura F, Yamazaki S, Yamamoto Y, Akizawa T, Akiba T, Saito A, Kurokawa K, Fukuhara S. Prescription of potentially inappropriate medications to elderly hemodialysis patients: prevalence and predictors. Nephrol Dial Transplant. 2015;30(3):498-505. https://doi.org/10.1093/ndt/gfu070

https://doi.org/10.18549/PharmPract.2019.2.1448

Original Research

Setting the agenda for clinical pharmacy in Qatar: thematic and content analyses of news media headlines

Mohammad DIAB, Kyle J. WILBY.

Received (first version): 11-Jan-2019 Accepted: 26-May-2019 Published online: 6-Jun-2019

Abstract

Background: Public awareness of the role of pharmacists and availability of pharmacy services in Qatar is low. As per agenda-setting theory, mass media may be contributing toward this problem by selecting and disseminating headlines and stories according their own objectives and not those of the profession.

Objectives: The objective of this study was to examine the agenda set by mass media organizations in Qatar pertaining to the profession of pharmacy and to determine the frequency of professional identifiers that appear within news headlines.

Methods: Publicly available news headlines published between November 2016 and November 2018 were obtained from local news websites. Thematic analysis was performed using agenda-setting theory to explore how the public's agenda was set for pharmacy practice in Qatar. Content analysis was used to determine the proportion of headlines that contained a professional identifier linking the news report to the pharmacy profession.

Results: A total of 81 headlines were included in the analysis. The agenda for pharmacy practice in Qatar was set according to two themes: achievement and outreach/engagement. Achievement related to awards, use of new technologies, interprofessional education, and novel student training accomplishments. Outreach/engagement reported student and pharmacist involvement upon completion of a health awareness event. Approximately half (47%) of headlines contained a professional identifying word linking the headline to the profession of pharmacy.

Conclusions: The findings of this study demonstrate that the mass media's agenda for the pharmacy profession in Qatar does not inform the public of pharmacist's services or expanded scopes of practice. Furthermore, a lack of professional identifiers within headlines likely limits the public's agenda of pharmacist roles. The pharmacy profession must work collaboratively with news media to better align the public's agenda with pharmacists' roles and services.

Keywords

Mass Media; Pharmaceutical Services; Pharmacies; Pharmacists; Professional Role; Journalism; Qualitative Research; Qatar

INTRODUCTION

The profession of pharmacy is undergoing a global reform with the advent of new roles and responsibilities, including expanded scopes of practice and increases in the number and types of services provided.[1,2] As such, pharmacist training programs are also being modernized with greater focus on person-centered care and the cognitive and clinical competencies required of pharmacists to meet and fulfill their expanded scope.[3] In order for reform to be successful and allow pharmacists to practice according to their full potential, however, the public must be aware of the types of services pharmacists offer and to what extent a pharmacist can meet their health-related needs. Public awareness and perception are vital to any professional change, as the public are the primary stakeholder for utilization of pharmacist services.[4,5] The more the public demands of pharmacists, for example, the more policymakers may further invest in the profession and facilitate advanced roles within global healthcare systems.[6]

In Qatar, the healthcare system is rapidly modernizing and advancing as part of the National Health Strategy and Qatar National Vision.[7,8] The National Health Strategy calls for better utilization of pharmacists, which includes facilitating the necessary infrastructure and legislation to allow them to practice according to their full scope.[7] This process has been largely supported by the opening of the first pharmacist training program in Qatar at Qatar University, which has been graduating pharmacists for practice since 2011.[9] The university offers four degree programs, including an entry-to-practice Bachelor of Science in Pharmacy, an entry-to-practice Doctor of Pharmacy (PharmD), a Masters of Pharmaceutical Sciences, and a Doctor of Philosophy. A pharmacy technician program is also present at the College of the North Atlantic – Qatar.[10] Due to differences in credentialing requirements and compensation, graduating pharmacists and pharmacy technicians largely work in hospital settings, while primary care centers and community pharmacists largely rely on foreign-trained workers. With the increase in workforce capacity, provision of pharmacist services has expanded in recent years.[11] Hospital pharmacists, for example, are well integrated into ward rounds and multidisciplinary teams. Pharmacists are also heavily involved in practice-based research and quality improvement initiatives, which is a core part of pharmacists' education in the country.[12] Roles in primary care and community are mainly dispensing and counselling oriented but efforts are being made to expand service provision in these settings.[7]

Despite the focus to modernize the profession in Qatar, public awareness of pharmacy and the services pharmacists offer remains low.[13] In one study, for example, it was found that >70% of patients did not expect pharmacists to monitor their health progress or offer any health-related

Mohammad DIAB. PhD. Dean and Assistant Professor. College of Pharmacy, Qatar University. Doha (Qatar). Mohamed.diab@qu.edu.qa
Kyle John WILBY. PharmD. Associate Professor. School of Pharmacy, University of Otago. Dunedin (New Zealand). kyle.wilby@otago.ac.nz

screening. Furthermore, the greatest desired service by patients was automatic processing of prescriptions, with much fewer respondents desiring professional and clinical services.[13] The reasons for this may be many, but may include a lack of experience of the public with pharmacists, a lack of locally-trained pharmacists providing front-line care in community pharmacies, or a lack of promotion by the profession itself regarding pharmacist roles and services available for public use. Pharmacists also report many barriers to providing professional services aside from preparing and dispensing medications (e.g. inconvenient access to patient information, lack of staff and time), which could limit their exposure and in turn, influence their perceived role by the public or even policymakers.[14,15]

One contributor to the public perception of pharmacists in society may be the way in which mass media portrays pharmacists and pharmacy services.[16] Media stories are typically published in both English and Arabic and headlines are also promoted using social media. As the media selects the articles to be published, they are in fact 'setting the agenda' of how pharmacy and pharmacists are presented to society.[17] This, in turn, may influence how the public perceives the profession, including the type and nature of roles and services pharmacists offer. No study to date has attempted to explore how the media could be contributory to public perceptions of pharmacy and pharmacists in Qatar. The objectives of this study, therefore, were to examine the agenda set by news organizations in Qatar pertaining to the profession of pharmacy and to determine how profession is identified within the news headlines themselves.

METHODS

Study Design

This qualitative study employed thematic and content analyses of news headlines to determine the effects of agenda setting by two major news organizations relating to the profession of pharmacy in Qatar.

Theoretical Framework

The theoretical framework informing this study is based on agenda setting theory. Agenda setting theory arises from the premise that the media, by selecting and reporting news stories related to a specific topic, has the ability to inform public opinion of what is important regarding that topic.[17,18] Agenda setting theory can be explained by the cognitive accessibility mechanism, which states that what a person is exposed to the most is what that person will typically recall. It also relates to 'how much' or 'how recently' one has exposed to a particular issue.[19] As such, accessibility associated with agenda setting is thought to be a memory-based model that assumes people tend to make judgements based on information readily retrievable from their memory.[20] The media, as a disseminator of news and headlines, is able to effectively influence what and how much one is exposed to and hence, drive the formation of memories regarding a particular topic.

There are three main types of agenda setting: public agenda setting; media agenda setting; and policy agenda setting.[19] In our case, the public's agenda may be first informed by the types of stories or news generated from the pharmacy profession in Qatar and then set by the media through prioritization and publication of chosen articles. According to agenda setting theory and the premise of accessibility, exposure of the public to the headlines and messages of these articles will initiate the formation of memories and allow information to be retrieved when prompted at a later date.[18-20] As such, the concept of agenda setting offers a theoretical lens to further understand how the media may influence public's perceptions of pharmacy and the societal role of pharmacists in Qatar.

Data sources

A keyword search of the two primary English-language news websites was conducted for headlines published between November 16th, 2016 and November 16th, 2018.[21,22] These Gulf Times and The Peninsula Qatar were chosen, as they offer news media in print, online, and social media forms, are the two locally-based news sources in Qatar, and should have captured the large majority of articles disseminated within Qatar's English-language media. Headlines are disseminated consistently across media forms and articles are well balanced across many topics, including a large focus on local news and events. A date range of two years was chosen, in order to ensure relevance to the current media-influenced conversations regarding pharmacy in Qatar. Each website had a search function and the keywords of 'pharmacy' and 'pharmacist' were each searched separately. Using the word 'pharmacist' also captured other forms of this word, including 'pharmacists', 'pharmacist's', and 'pharmacists''. Other related terms (such as medication) were not searched, as the aim of the study was to capture headlines that were identifiable to the profession. One investigator assessed identified articles for relevance to the pharmacy profession and extracted headlines of these articles into an excel spreadsheet for each website and keyword search. One investigator then combined and sorted the headlines to remove duplicates. The final set of headlines, after duplicates were removed, formed the basis for the discourse and content analyses. Headlines were chosen as the unit of analysis, as compared to full articles, based on previous studies employing similar methodology and the assumption that the headline would reflect the content of the news article and be the greatest contributing factor to formation of memories.[23,24]

Thematic analysis

A thematic analysis was used to answer the first research question. The general method used in this study was reported previously.[25] Briefly for this study, headlines were read multiple times by one investigator (KW). This investigator received previous training in qualitative research and has led numerous projects employing qualitative research methods. Once familiar with the general nature of the headlines, this investigator began inductively coding headlines by assigning one or two words that represented the topic of the headline. Once coding was complete for all headlines, the investigator re-read headlines and codes in an iterative fashion to confirm coding and begin grouping coded headlines together into similar categories. This process was repeated until the

Table 1. Discourse themes and illustrative headlines

Theme	Headlines
Achievement	1. QU-CPH students complete pharmacy program in US 2. QU college wins top honours in national and global events 3. Wellcare pharmacies open 40th branch 4. HGH's pharmacy robot cuts waiting time for patients 5. Qatar University College of Pharmacy wins poster contest in Oman 6. Sidra opens three pharmacies 7. QU-CPH MSc graduate wins Best Poster Award 8. 31 Students take oath of a pharmacist 9. CAN-Q honours Wellcare pharmacy group 10. Qatar University launces pharmacy postgraduate society
Outreach/Engagement	1. QU's Health Cluster marks Hemophilia Day 2. QU Healthcare students take part in antimicrobial stewardship 3. College of Pharmacy signs MoU with Qatar Pharma 4. QU-CPH students hold awareness campaign on common cold, allergies 5. QU collaborates on IPE smoking awareness drive 6. Smoking cessation awareness campaign held 7. QU-CPH shares Ramadan tips on use of medications 8. QU-CPH organises mediation awareness campaign 9. QU pharmacy chapter holds 'go smart' event 10. HMC pharmacy department holds medication management campaign

QU-CPH = Qatar University – College of Pharmacy; US = United States; HGH = Hamad General Hospital; QU = Qatar University; MoU = Memorandum of Understanding; IPE = Interprofessional Education

coding framework was deemed to be stable. A total of six categories were initially identified according to this process (operations and training, continuing professional development, technology, role, awards, agreements, student training). At this point, the second investigator (MD) was provided the data to review and then discussed the six categories with the first investigator. Using discussion and consensus, the two investigators interpreted two themes related to the agenda media sets for the pharmacy profession in Qatar.

Content Analysis

A content analysis was used to answer the second research objective.[26] For this analysis, the headlines were re-coded based on whether or not they included any identifying word specific to the profession of pharmacy. In all cases of coding, this was any instance of the words (or derivatives of) "pharmacy", "pharmacist", or "pharmacy technician". If two or more words were present in a headline, it was only coded once. Once coding was complete, the frequency and proportion of headlines containing coded words were calculated.

RESULTS

A total of 95 articles and headlines were identified based on the search methods described above. After screening for duplication and relevance to the profession of pharmacy in Qatar, 81 remained. Irrelevant articles included those that linked to articles with embedded advertisements for pharmacy or those that did not have any content related to pharmacy or pharmacists. Upon completion of the analysis, two agenda setting themes were interpreted from the data: achievement, and outreach/engagement. Illustrative headlines supporting each theme are provided in Table 1.

Theme 1: Achievement

News organizations in Qatar focus on achievement of students, faculty members, employees, organizations, and interprofessional activities as a major part of the media's agenda for pharmacy. Achievement was documented with respect to awards, completion of specialized or international training programs, hosting of conferences or meetings, and signing of collaborative agreements both locally and abroad. Achievement was not only limited to pharmacy, but also included interprofessional achievement (i.e. training programs and awards) that pharmacy students or pharmacists were part of. The last component of achievement focused on technology and operations achievements of pharmacies or pharmacy departments, specifically relating to the acquiring and use of robotic systems in medication preparation and distribution.

Theme 2: Outreach and Engagement

The second agenda setting theme was that of outreach and engagement. News headlines reported health promotion initiatives conducted by pharmacy students or pharmacists that typically occurred in public settings, such as malls or sports parks. Headlines were typically a summary of the event and reported after the event occurred. Similar, to achievement, outreach and engagement initiatives also included a strong interprofessional component where pharmacy students or pharmacists were included within a broader label as health professionals.

Content Analysis

Of 81 coded headlines, 38 (47%) contained an identifier word specific to the pharmacy profession. The remaining 43 (53%) used acronyms that would not be known to the public (e.g., CPH = College of Pharmacy), used broader terms to describe interprofessional activities (QU Health, Interprofessional Education), or did not contain any identifier word ('Smoking cessation awareness campaign held').

DISCUSSION

The purpose of this study was to examine the agenda set by news organizations in Qatar pertaining to the profession of pharmacy and to determine how profession is identified within the news headlines themselves. Two themes were

identified: achievement and outreach/engagement. These themes encompassed different aspects of the profession (student training, technological advances, awards, interprofessional activities, etc.) but exposed a gap in the media pertaining to pharmacy services and the role of pharmacists in society. Specifically, there was no link between the identified articles and direct patient care services. There was also no public discussion about pharmacist services and scope of practice. Furthermore, the content analysis demonstrated that only approximately half of headlines contained identifying words that associated news stories with pharmacy or pharmacists.

The findings of this study demonstrate that the agenda set by the news media in promoting headlines relating to pharmacy focuses primarily on achievements and events, rather than highlighting professional roles or services. The public, therefore, does not appear to be exposed to headlines outlining pharmacist roles or services by mainstream news sources. According to the results of this study, the public mainly receives messages from headlines stating that pharmacy students and pharmacists win awards or complete specialized or international training programs, and that they organize or participate in health promotion activities. The reasons for this may be two-fold. First, as per agenda-setting theory, it is possible that the news outlets deem headlines about achievement and outreach/engagement to be the most newsworthy for their readers and preferentially select these for publication.[20] Secondly, it is also possible that the profession itself does not generate headlines outside of these themes for the news organizations to report. Furthermore, the profession may not realize the importance of generating headlines that provide the public with a greater perspective of the profession and the services pharmacists offer. If this is the case, the agenda for the public is being set not only by the news organization but also by the profession itself.[27] Key professional stakeholders in both education and practice should therefore be encouraged to collectively use opportunities within news media to promote headlines and articles that provide a greater representation of the professional roles and services available in Qatar.

The other key finding from this study is that the majority of headlines do not contain any professional identifiers that link the news item to pharmacy. As per agenda-setting theory, public agenda setting is largely based on memories and recall.[19,20] Therefore, headlines that do not contain identifiers to the subject matter would not contribute to a person's memories of that particular topic. Based on the results of this study, more than half of headlines identified would fall into this category and would not influence one's set of memories specific to pharmacy, unless they read the entire article. One explanation for this finding appears to be the advent of 'QU Health', which is a division of health sciences colleges (College of Pharmacy, College of Medicine, and College of Health Sciences) now operating collectively under one banner. The public, however, likely does not know what QU Health represents and which professions are embedded within. Consequently, attempts to brand health programs according to one entity must be balanced with the need to distinguish between professions.

The results of this study add to the greater field of agenda-setting, as facilitated by news media headlines. To our knowledge, this is the first study to assess how the public's agenda for the pharmacy profession is set using news media headlines in any international setting. Related studies appear to show more in-depth discourse regarding professional roles and services in other settings yet are difficult to compare due to analysis beyond what is presented in news headlines.[16,28,29] Our findings that headlines are focused on more 'eye-catching' concepts such as achievement and engagement do align with other headline studies showing the same.[23,24] Whether or not this agenda set by headlines is similar or different than what is supported by the full articles, however, remains yet to be explored.

These findings have implications for the profession of pharmacy in Qatar. First, academic and practice organizations should reassess the types of news articles generated from their settings and determine if headlines and articles can provide greater focus on the professional role of pharmacists in society. If these articles match the agenda of the news organizations and are published, the public may be better exposed to the profession and perceive pharmacists more aligned to their actual scope of practice. Secondly, all parties involved should attempt to strike a balance between collective marketing in media submissions (e.g. under the guise of umbrella organizations, such as 'QU Health') and promoting submissions that contain professional identifying words. By doing so, the public may have better memory recall of professional roles yet will still be exposed to larger initiatives accomplished under collective (e.g., interprofessional) terms. Future studies should also be designed to investigate how other sources of information (social media, real-life experience) help to inform the public's perception of pharmacy, in order to focus professional promotional strategies in the most impactful way.

This study has limitations that must be addressed. First, only headlines written in English were included and no attempt was made to capture headlines published in Arabic. Any effect of this should be minimal, however, as most headlines appear in both English and Arabic news sources. Secondly, types of articles written and selected for publication in Qatar probably differ as compared to other countries, likely due to factors such as the lack of professional advocacy groups. That being said, the findings of this study may be transferable to other settings, especially where dissemination of articles for the news media is occurring at a divisional or institutional level. Thirdly, the analysis was based on headlines and not full-text articles. Although more professional identifiers and/or discourse relating to professional roles and services may have been identified from full-text review, the intent of this study was to analyze the content (i.e. headlines) most visible to the public eye. Analysis of the stories associated with the headlines could be explored in further studies. Fourth, we could not account for images associated with each headline at the time of publishing that may have contributed to the public's interest in the article. Finally, as mentioned above, these news organizations are not the only sources of information that may inform the public

agenda relating to pharmacy. Despite these limitations, we believe the rigour of our approach and dependability of our results supports the trustworthiness of our study and the resulting implications.

CONCLUSIONS

This study found, based on agenda-setting theory, that the primary news organizations in Qatar set the agenda for the public by publishing headlines relating to achievement and outreach/engagement in pharmacy. Furthermore, the majority of headlines did not contain any professional identifiers that could link the public's memories with the profession itself. These findings support the notion that portrayal (or lack thereof) of pharmacy roles by the news media may contribute to a lack of recognition by the public for the scope of services able to be provided by pharmacists. Future studies should be designed to further investigate the impact of these findings and also to identify other information sources that may be impacting the public's agenda of pharmacy practice in Qatar.

CONFLICT OF INTEREST

None.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Hawthorne N, Anderson C. The global pharmacy workforce: a systematic review of the literature. Hum Resour Health. 2009;7:48. https://doi.org/10.1186/1478-4491-7-48
2. Easter J, Jani Y, Kirkpatrick C, Steeb D, Eckel S. Unifying a profession and a health care system: Building the case for a "one pharmacy" global community. Res Soc Admin Pharm. Forthcoming 2019 [Epub ahead of print]. https://doi.org/10.1016/j.sapharm.2019.04.048
3. Stupans I, Atkinson J, Mestrovic A, Nash R, Rouse MJ. A shared focus: comparing the Australian, Canadian, United Kingdom and United States pharmacy learning outcome frameworks and the global competency framework. Pharmacy (Basel). 2016;4(3):26. https://doi.org/10.3390/pharmacy4030026
4. Iversen L, Mollison J, MacLeod TN. Attitudes of the general public to the expanding role of community pharmacists: a pilot study. Fam Pract. 2001;18(5):534-536. https://doi.org/10.1093/fampra/18.5.534
5. Eades CE, Ferguson JS, O'Carroll RE. Public health in community pharmacy: a systematic review of pharmacist and consumer views. BMC Public Health. 2011;11:582. https://doi.org/10.1186/1471-2458-11-582
6. Burstein P. The impact of public opinion on public policy: a review and an agenda. Pol Res Quart. 2003;56(1):29-40.
7. National Health Strategy 2018-2022. Ministry of Public Health. Available at: https://www.moph.gov.qa/HSF/Pages/NHS-18-22.aspx (accessed Jan 10, 2019).
8. Qatar National Vision 2030. Ministry of Development Planning and Statistics. Available at: https://www.mdps.gov.qa/en/qnv1/pages/default.aspx (accessed Jan 10, 2019).
9. College of Pharmacy. Qatar University. Available at: http://www.qu.edu.qa/pharmacy/ (accessed Jan 10, 2019).
10. Pharmacy Technician. College of the North Atlantic – Qatar. https://www.cna-qatar.com/programs/schoolofhealthsciences/pharmacytechnician (accessed Jan 10, 2019).
11. Kheir N. Chapter 12 – Pharmacy practice in Qatar. In: Fathelrahman AI, Ibrahim MIM, Wertheimer AI, ed. Pharmacy Practice in Developing Countries: Achievements and Challenges. London, UK: Academic Press; 2016.
12. Awaisu A, Kheir N, Alrowashdeh HA, Allouch SN, Jebara T, Zaidan M, Ibrahim MIM. Impact of a pharmacy practice research capacity-building programme on improving the research abilities of pharmacists at two specialised tertiary care hospitals in Qatar: a preliminary study. J Pharm Health Serv Res 2015;6(3):155-164. https://doi.org/10.1111/jphs.12101
13. El Hajj MS, Salem S, Mansoor H. Public's attitudes towards community pharmacy in Qatar: a pilot study. Patient Prefer Adherence. 2011;5:405-422. https://doi.org/10.2147/PPA.S22117
14. El Hajj MS, Hammad AS, Afifi HM. Pharmacy students' attitudes toward pharmaceutical care in Qatar. Ther Clin Risk Manag. 2014;10:121-129. https://doi.org/10.2147/TCRM.S56982
15. El Hajj MS, Al-Saeed HS, Khaja M. Qatar pharmacists' understanding, attitudes, practice and perceived barriers related to providing pharmaceutical care. Int J Clin Pharm. 2016;38(2):330-343. https://doi.org/10.1007/s11096-016-0246-0
16. Schindel TJ, Given LM. The pharmacist as prescriber: a discourse analysis of newspaper media in Canada Res Social Adm Pharm. 2013;9(4):384-395. https://doi.org/10.1016/j.sapharm.2012.05.014
17. Scheufele DA, Tewksbury D. Framing, agenda setting, and priming: the evolution of three media effects models. J Commun. 2007;57(1):9-20. https://doi.org/10.1111/j.0021-9916.2007.00326.x
18. McCombs ME, Shaw DL. The agenda-setting function of mass media. Public Opin Q. 1972;36(2):176-187.
19. Kim S, Scheufele DA, Shanahan J. Think about it this way: attribute agenda-setting function of the press and the public's evaluation of a local issue. Journal Mass Commun Q. 2002;79(1):7-25. https://doi.org/10.1177%2F107769900207900102
20. Scheufele DA. Agenda-setting, priming, and framing revisited: another look at cognitive effects of political communication. Mass Commun Soc. 2000;3(2-3):297-316. https://doi.org/10.1207/S15327825MCS0323_07
21. Search. Gulf Times. Available at: https://www.gulf-times.com (accessed Jan 10, 2019).
22. Search. The Peninsula. Available at: https://www.thepeninsulaqatar.com (accessed Jan 10, 2019).
23. Andrew, BC. Media-generated shortcuts: Do newspaper headlines present another roadblock for low-information rationality? Int J Press/Politics 2007;12(2):24-43. https://doi.org/10.1177%2F1081180X07299795

24. Blom JN, Hansen KR. Click bait: Forward-reference as lure in online news headlines. J Pragmatics 2015;76:87-100. https://doi.org/10.1016/j.pragma.2014.11.010
25. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol 2006;3(2):77-101. https://doi.org/10.1191/1478088706qp063oa
26. Holdford D. Content analysis methods for conducting research in social and administrative pharmacy. Res Social Adm Pharm. 2008;4(2):173-181. https://doi.org/10.1016/j.sapharm.2007.03.003
27. Uscinski JE. When does the public's issue agenda affect the media's issue agenda (and vice-versa)? Developing a framework for media-public influence. Soc Sci Q. 2009;90(4):796-815. https://doi.org/10.1111/j.1540-6237.2009.00663.x
28. Cain J, Dillon G. Analysis of pharmacy-centric blogs: Types, discourse themes, and issues. J Am Pharm Assoc (2003). 2010;50(6):714-719. https://doi.org/10.1331/JAPhA.2010.10025
29. Hughes CA, Breault RR, Hicks D, Schindel TJ. Positioning pharmacists' roles in primary health care: a discourse analysis of the compensation plan in Alberta, Canada. BMC Health Serv Res. 2017;17(1):770. https://doi.org/10.1186/s12913-017-2734-x

Oyetunde OO, Ogidan O, Akinyemi MI, Ogunbameru AA, Asaolu OF. Mobile authentication service in Nigeria: An assessment of community pharmacists' acceptance and providers' views of successes and challenges of deployment. Pharmacy Practice 2019 Apr-Jun;17(2):1449.

https://doi.org/10.18549/PharmPract.2019.2.1449

Original Research

Mobile authentication service in Nigeria: An assessment of community pharmacists' acceptance and providers' views of successes and challenges of deployment

Olubukola O. OYETUNDE, Olayiwola OGIDAN, Mary I. AKINYEMI, Adeteju A. OGUNBAMERU, Olubunmi F. ASAOLU.

Received (first version): 12-Jan-2019 Accepted: 8-Apr-2019 Published online: 5-Jun-2019

Abstract

Background: Mobile Authentication Service (MAS) is a mobile health technology deployed to hinder the retailing of falsified medicines to consumers in Nigeria. But, some community pharmacists reported that points of failures of MAS have negatively impacted their practices.

Objectives: The objectives of this study were (1) to assess the acceptance of MAS by community pharmacists; (2) to explore the views of MAS providers on the challenges and successes of MAS deployment in Nigeria.

Methods: A quantitative cross sectional survey was used to investigate community pharmacists' acceptance of MAS. A validated structured questionnaire, based on Technology Acceptance Model, was distributed to 326 community pharmacists. In addition, a structured interview guide was employed to explore MAS providers' views of challenges and successes of MAS deployment in Nigeria.

Results: Just about half (53%) of responding community pharmacists were keen on using MAS. In addition, 51% of them would recommend the service to other practitioners and 54% would encourage their clients to use it. The results of the study indicated that both awareness and perceived reliability played important role in the behavioural intention to use the MAS. The findings from the exploration of MAS providers' views showed that the problems encountered with MAS (no response and wrong response) were mainly due to contextual challenges in the Nigerian setting. These contextual challenges like the Global System Mobile downtime, incessant power outages and limited ability of consumers to use the Short Message Service, all contributed to the limited success of MAS in Nigeria.

Conclusions: Acceptance of mobile authentication service by community pharmacists is moderate. Perceived reliability and awareness are important factors that affect behavioural intention to use MAS. The limited success of MAS deployment appeared to be as a result of its interaction with the local context, where it has been deployed.

Keywords

Information Technology; Mobile Applications; Telemedicine; Counterfeit Drugs; Drug Trafficking; Pharmacies; Perception; Awareness; Attitude of Health Personnel; Surveys and Questionnaires; Nigeria

INTRODUCTION

Substandard and falsified medicines constitute a global challenge for health systems, especially in low-to-middle income countries (LMIC). A recent meta-analysis reported a prevalence of 13.6% of substandard and falsified medicines in LMIC.[1] World Health Organization estimated that about one in 10 medical products in LMIC are substandard and falsified products.[2] substandard and falsified medicines burden health systems, erode confidence in the system, increase the risk of illness morbidity and mortality. Substandard and falsified medicines waste essential drugs earmarked by government and individuals, which LMIC residents often cannot afford.[1,2]

Olubukola Olusola OYETUNDE. PhD. Lecturer. Department of Clinical Pharmacy & Biopharmacy, CMUL, University of Lagos. Lagos (Nigeria). bukkydada@yahoo.com
Olayiwola OGIDAN. FPCPharm. Assistant Director. Pharmacists Council of Nigeria, Lagos (Nigeria). temilai@yahoo.com
Mary Idowu AKINYEMI. PhD. Lecturer. Department of Mathematics, Faculty of Science, University of Lagos. Lagos (Nigeria). maryi.akinyemi@gmail.com
Adeteju Ajibike OGUNBAMERU. MSc. Lecturer. Department of Clinical Pharmacy & Biopharmacy, CMUL, University of Lagos. Lagos (Nigeria). aadedini@unilag.edu.ng
Olubunmi Felicia ASAOLU. BPharm. Department of Clinical Pharmacy & Biopharmacy, CMUL, University of Lagos. Lagos (Nigeria). asaoluolubunmi@gmail.com

Nigeria is reported to have one of the highest incidences of substandard and falsified medicines in Sub-Saharan Africa.[3] Over the years, the estimated prevalence of substandard and falsified medicines seems to have reduced in Nigeria from 67% in 2001 to 5% in 2012.[3] Also, there have been several reports of fatalities from the consumption of substandard and falsified medicines in Nigeria.[4] Consequently, the Nigerian medicine regulatory authority, National Agency of Food Drug Administration and Control (NAFDAC), adopted multiple approaches to combat the problem of substandard and falsified medicines. Some of the approaches include deployment of product authentication devices like TRUSCAN® for in-the-field test for authenticity of product, retailer product authentication using radio frequency identification tagging and the Mobile Authentication Service (MAS).[3,5] MAS involves consumers' use of mobile phones to verify the source of medicines at the point of purchase at medicine retail outlets.

MAS is a mobile health technology (mHealth) deployed to hinder the retailing of falsified medicines to consumers. The service is provided by NAFDAC-approved, third party private information-communication technology firms (MAS providers) to pharmaceutical manufacturers and importers in Nigeria. According to a recent NAFDAC implementation guideline, marketing authorisation holder of any medicines

seeking to engage the MAS providers' services must notify NAFDAC and MAS providers must verify the NAFDAC registration status of medicines before deployment. NAFDAC should receive safe and secure data about deployed MAS from service providers.[6]

Pharmaceutical manufacturers or importers enabled their product packs through MAS service providers. The MAS providers grant pharmaceutical companies access to MAS scratch panel, which is affixed to the product. The scratch panel covers an alphanumeric code, which is a one-time use product personal identification number (PIN). Consumers are expected to scratch the panel and text the PIN to a dedicated phone number provided on the medicine pack. The consumer should receive a real-time, short message service (SMS) text response to authenticate the source of the medicine. Following request by consumers, all MAS providers now have a unified response which is either; a 'confirmed' message, to indicate that the drug product is genuine, or 'unregistered product', message, to show that the originality of the product cannot be verified. In this latter case, the consumer should call up the contact centre listed on the drug product for further directive.[6] In 2012, NAFDAC rolled out the mandatory first phase of MAS deployment on all antimicrobials and anti-malaria medicines in Nigeria.[7]

A study reported that MAS responses positively correlate with the quality of medicine products and another small scale study reported that manufacturer/importer found the deployment of MAS effective to curb falsification of their products.[8,9] However, there are reports suggesting there are challenges with the use of MAS in Nigeria. Several studies have documented underutilization by consumers despite a reasonable level of awareness.[10-12] A pilot study demonstrated that response was not always real-time.[13] Also, some community pharmacists reported that MAS impacted their practices negatively. These community pharmacists complained that response is not always real time, as expected, and consumers sometimes get no or wrong responses to MAS queries.[14] These points-of-failure of the MAS have inadvertently portrayed the affected community pharmacies as sources of substandard and falsified medicines. Therefore, the acceptance of MAS among community pharmacists is unknown. Acceptance of MAS by community pharmacists is important for MAS to remain relevant as a tool for tracking substandard and falsified medicines in retail pharmacy practice. In addition, the challenges encountered by MAS providers at the point of deployment, which might contribute to these points of failures, are also unknown. For MAS continued usefulness, challenges associated with its deployment need investigation.

The objectives of this study were (1) to assess the acceptance of MAS by community pharmacists; (2) to explore the views of MAS providers about the challenges and successes of MAS deployment in Nigeria.

METHODS

Study design

A mixed-methods approach was employed to investigate the stated objectives. A quantitative cross sectional survey was used to investigate community pharmacists' acceptance of MAS, while a qualitative research approach was employed to explore MAS providers' views of challenges and successes of its deployment in Nigeria.

Ethics Approval

The study protocol was approved by the Lagos University Teaching Hospital Health Research Ethics committee (Assigned no: ADM/DCST/HREC/APP/1801). The protocol was, however, exempted from a full review.

Study population

The study population for the acceptance of MAS by community pharmacists consists of some nationwide community pharmacists registered with the Pharmacists' Council of Nigeria. NAFDAC-approved MAS providers in Nigeria were recruited to explore their views on MAS deployment.

Study Instruments Development

Two study instruments were developed, standardized and used for the study. Firstly, a validated structured questionnaire for the community pharmacists (Cronbach alpha=0.949) was developed based on the Technology Acceptance Model (TAM).[15] The instrument was used to collect demographics of participants and their responses to questions based on the model constructs (Online appendix). TAM model was selected for the study because reviews have found it to be robust and versatile to predict technological acceptance and usefulness in a wide variety of context.[16] The model postulates a causal relationship between users' perception of a technology and their acceptance of the technology and between their acceptance and use.[17]

TAM is built on two independent variables; perceived usefulness and perceived ease of use; and the dependent variable: attitude towards use. According to the model, a user's perceptions about a system's usefulness and ease of use results in a behavioural intention to use (or not to use) the system. In order to meet the objectives of this research, the TAM was extended to include awareness, job Relevance and perceived reliability to help understand and explain behavioural intention to use MAS.

Secondly, a structured interview guide was developed to assess three domains of MAS providers' views. These are successes of MAS deployment, the challenges with the deployment of MAS, as well as possible action plans for pharmacists when it fails (no response to their customers' queries). These domains were based on personal communications with community pharmacists, previous study with manufacturers that have deployed MAS and reports in Nigeria newspapers.

Sample size and sampling technique

An online sample size calculator (Raosoft®) was used to calculate study sample size.[18] At 95% confidence level, 5% margin of error and a total of 5435 registered community pharmacists (2016 register of Pharmacists Council of Nigeria), the study sample was 359. A response rate of 50% was assumed, therefore, a total of 573 questionnaires were planned for distribution. The study used convenience

Table 1. Descriptive statistics of respondents' characteristics (n=326)

Items	Frequency	Percent
Age		
Less than 25	14	4.29
25-30	83	25.46
31-40	115	35.28
41-50	68	20.86
above 50	46	14.11
Gender		
Male	218	67.08
Female	107	32.92
Years of community pharmacy practice		
Less than 5	151	46.89
6-10	74	22.98
11-20	54	16.77
21-30	25	7.76
30-40	17	5.28
Above 40	1	0.31

sampling method. Pharmacists that visited zonal offices of Pharmacists' Council of Nigeria, across the country during the study period, were introduced to the study and offered the questionnaire to fill and return, as soon as possible.

For the qualitative exploration, all service providers were invited to participate in the study. There were five NAFDAC-approved service providers as of the time of the study. However, only three providers participated in the study.

Data collection

The study questionnaires, with a brief introduction, were distributed to community pharmacists through the Pharmacists' Council of Nigeria zonal offices nationwide. Informed consent was assumed, if questionnaire is returned back to the zonal offices.

The five NAFDAC-approved service providers were contacted through the official phones available on their websites. They were offered two options of interview media: face-to-face interview or by e-mail. The e-mail is a viable and valuable medium for qualitative study interview though with limitations.[19] All the service providers opted for the e-mail option and provided the researcher with appropriate e-mail addresses of the personnel that responded. The structured interview guide was then sent to and received from service providers by e-mails. Reminder e-mails were sent twice to the two unresponsive MAS providers, but their continued non-response was assumed to indicate their unwillingness to participate in the study.

Data analysis

All the statistical analysis in this section was done using R.[20] Demographic analysis was carried out by computing descriptive statistics. To assess the internal consistency of the constructs, reliability and validity were measured using the Cronbach's alpha. Hypotheses were formed to investigate causality/dependencies between the constructs. Multiple linear regression models were built on each set of hypotheses and the model diagnostics were examined to validate each hypothesis.

The textual nature of e-mail exchanges allows for thematic analysis, which was used to analyse returned MAS provider's questionnaires.[19] The concepts that were explored were predetermined, as covered by the structured interview guide sent to providers. Concepts explored include success, challenges, lack of response to authentication queries, possible pharmacists' responses and the future of MAS in Nigeria. Codes were identified from the collected data and mapped into the predetermined concepts to form the coding framework.

Table 2. Mean, standard deviation and alpha coefficient of study variables (n=326)

Variable	Mean	SD	Alpha
Awareness	1.26	0.42	0.72
Perceived usefulness	3.31	0.85	0.74
Perceived ease of use	3.86	0.71	0.69
Attitude towards usage	2.98	0.8	0.71
Perceived reliability	2.73	0.82	0.70
Job relevance	6.96	0.89	0.73
Behavioral Intention to Use	3.59	0.98	0.79

SD: Standard deviation

RESULTS

The results are presented in two parts. In the first part, the results of the quantitative cross sectional survey of the community pharmacists were presented. The second part reported the findings of qualitative study of the MAS service providers.

Part A

A total of 326 community pharmacists filled and returned their questionnaires, which were analysed to serve as the sample size. The results showed that over 67% of respondents were males (Table 1). Furthermore, about half (about 46%) of the respondents had less than 5 years community experience, while less than 1% of the respondents had more than 40 years community pharmacy practice experience.

Table 2 shows the descriptive statistics of the variables in the study (i.e. Awareness, Perceived usefulness, Perceived ease of use, Attitude towards usage, Perceived reliability, Job relevance and Behavioural Intention to use). The reliability of each variable was computed using Cronbach Alpha.[20] Apart from "Perceived ease of use", which had a reliability coefficient of 69%, all independent variables demonstrate acceptable values (>0.70), which indicates that they were reliable measures for their respective constructs. Table 3 below documented the list of hypotheses considered in investigating causality/dependencies between the constructs. Multiple linear regression models were built on each set of hypotheses and the model diagnostics were examined to validate each hypothesis. The results of the model diagnostics are presented in Table 4. Figure 1 gives a summary of causality/dependencies between the constructs based on the supported hypothesis in Table 4.

It was observed from Table 4 that hypothesis H1a, H1c and H1f were supported indicating that awareness, attitude and perceived reliability all positively affect behavioural intention to use MAS.

Also, hypothesis H2c and H2d were supported so that only behavioural intention to use MAS and perceived ease of use have positive effect on attitude to MAS usage. It was also observed that awareness and perceived reliability negatively affect attitude to use MAS.

Table 3. Hypothesis considered	
H1a	Behavioral intention to use the MAS is positively influenced by awareness.
H1b	Behavioral intention to use the MAS is positively influenced by job relevance.
H1c	Behavioral intention to use the MAS is positively influenced by attitude towards usage.
H1d	Behavioral intention to use the MAS is positively influenced by perceived ease of use.
H1e	Behavioral intention to use the MAS is positively influenced by perceived usefulness.
H1f	Behavioral intention to use the MAS is positively influenced by perceived reliability.
H2a	Attitude towards MAS usage is positively influenced by awareness.
H2b	Attitude towards MAS usage is positively influenced by job relevance.
H2c	Attitude towards MAS usage is positively influenced by behavioral intention to use MAS.
H2d	Attitude towards MAS usage is positively influenced by perceived ease of use.
H2e	Attitude towards MAS usage is positively influenced by perceived usefulness.
H2f	Attitude towards MAS usage is positively influenced by perceived reliability.
H3a	Perceived usefulness of MAS is positively influenced by awareness.
H3b	Perceived usefulness of MAS is positively influenced by job relevance.
H3c	Perceived usefulness of MAS is positively influenced by attitude towards usage.
H3d	Perceived usefulness of MAS is positively influenced by behavioral intention to use MAS.
H3e	Perceived usefulness of MAS is positively influenced by perceived ease of use.
H3f	Perceived usefulness of MAS is positively influenced by perceived reliability.
H4a	Perceived ease of use of MAS is positively influenced by awareness.
H4b	Perceived ease of use of MAS is positively influenced by job relevance.
H4c	Perceived ease of use of MAS is positively influenced by attitude towards usage.
H4d	Perceived ease of use of MAS is positively influenced by behavioral intention to use MAS.
H4e	Perceived ease of use of MAS is positively influenced by perceived usefulness.
H4f	Perceived ease of use of MAS is positively influenced by perceived reliability.
H5a	Perceived reliability of MAS is positively influenced by awareness.
H5b	Perceived reliability of MAS is positively influenced by job relevance.
H5c	Perceived reliability of MAS is positively influenced by attitude towards usage.
H5d	Perceived reliability of MAS is positively influenced by behavioral intention to use MAS.
H5e	Perceived reliability of MAS is positively influenced by perceived ease of use.
H5f	Perceived reliability of MAS is positively influenced by perceived usefulness.

Hypothesis H3a and H3e were supported indicating that awareness and perceived ease of use positively affected perceived usefulness of MAS. Hypothesis H4b, H4c, H4d, H4e were supported, indicating that job relevance, behavioural intention to use, attitude towards usage and perceived usefulness all positively affected perceived ease of use, while awareness and perceived reliability negatively affected perceived ease of use. Furthermore, hypothesis H5b and H5d were supported. It can be inferred that only job relevance and attitude towards usage positively affected perceived reliability, but behavioural intention to use and perceived usefulness negatively affected perceived reliability

It was also observed from Table 4 that awareness (beta=0.30) and perceived reliability (beta=0.29) were the highest influencers of behavioural intention to use MAS, while perceived ease of use (beta=0.23) was the highest influencer of attitude towards MAS usage.

Again, awareness (beta=0.24) and perceived ease of use (beta=0.23) were the highest influencers of perceived usefulness and perceived ease of use (beta=0.38) was the highest influencer of perceived usefulness. In addition, Job relevance (beta=0.32) was the highest influencer of perceived reliability.

Furthermore, the result showed that more than half (53%) of respondents were keen on using MAS, 51% of respondents reported that they would recommend the service to other practitioners and 54% indicated they would encourage their clients to use the service. It was also observed that 46% would check the authenticity of all medication before dispensing, while 48% would only check if the medication is from an unfamiliar source. Overall, it can be inferred that about half of the community pharmacists in our coverage regions were positively disposed towards the use of MAS.

Part B

The findings on the views of MAS providers presented in a 3-part section covered the successes and challenges of MAS deployment in Nigeria. The first section presented the themes that captured MAS providers' views of the successful deployment. The second section highlighted themes that expressed the challenges encountered during deployment, which might be responsible for pharmacists experiences of no or wrong responses to queries. The final section explained MAS providers' views on what pharmacists can do when MAS queries give no or wrong response.

Theme: Circumstantial evidence to support success of MAS

Service providers seem to view the deployment of MAS as successful tool to prevent sales of MAS-enabled substandard and falsified medicines. Their views were based on increase in sales of MAS-enabled medicines by their manufacturers/importers. Also, service providers expressed the adoption of MAS by pharmaceutical

https://doi.org/10.18549/PharmPract.2019.2.1449

Table 4. Results of regression tests. Each test reports dependent variable first, followed by the list of independent variables beta.

Regression test	Adjusted R^2	beta	Hypothesis result
Behavioral intention to use	0.17***		
Awareness		0.30*	H1a: supported
Job relevance		0.01	H1b: not supported
Attitude towards usage		0.23**	H1c: supported
Perceived ease of use		0.14	H1d: not supported
Perceived usefulness		0.12	H1e: not supported
Perceived Reliability		0.29***	H1f: supported
Attitude towards usage	0.15***		
Awareness		-0.18	H2a: not supported
Job relevance		0.19	H2b: not supported
Behavioral intention to use		0.18**	H2c: supported
Perceived ease of use		0.23***	H2d: supported
Perceived usefulness		0.14	H2e: not supported
Perceived Reliability		-0.07	H2f: not supported
Perceived usefulness	0.18***		
Awareness		0.24**	H3a: supported
Job relevance		0.00	H3b: not supported
Behavioral intention to use		0.07	H3c: not supported
Attitude towards usage		0.05	H3d: not supported
Perceived ease of use		0.23***	H3e: supported
Perceived reliability		0.09	H3f: not supported
Perceived ease of use	0.21***		
Awareness		-0.20	H4a: not supported
Job relevance		0.27**	H4b: supported
Behavioral intention to use		0.20***	H4c: supported
Attitude towards usage		0.10	H4d: supported
Perceived usefulness		0.38***	H4e: supported
Perceived reliability		-0.10	H4f: not supported
Perceived reliability	0.14***		
Awareness		0.19	H5a: not supported
Job relevance		0.32**	H5b: supported
Behavioral intention to use		-0.07	H5c: not supported
Attitude towards usage		0.21***	H5d: supported
Perceived ease of use		0.16	H5e: not supported
Perceived usefulness		-0.10	H5f: not supported

Dependent variables are represented in bold italics, *p<0.1,**P<0.05,***p<0.01

companies, whose products are not required by regulations to use MAS, as a testament of the success of the technology.

> SP1: "…Pharmaceutical companies are seeing an increase in sales after implementation of the technology..."

However, a service provider expressed lack of objective evidence to support success of MAS technology.

> SP2: "Success is reduction in the prevalence of fake drugs as a result of deployment of the technology. There is no empirical study to test that claim yet. Therefore, I cannot tell if it is a success yet."

The current measures of MAS success by service providers appear subjective.

Theme: Lack of responses to MAS queries are due to factors in the setting

The main challenge reported by pharmacists was no or wrong response to MAS queries by consumers. The factors that contributed to this challenge were mainly contextual to the Nigerian setting. In this study, three major contextual challenges were described. Firstly, was the global system mobile (GSM) phone operation in Nigeria.

> SP1: "…the telecom providers having downtime with their service, which affects prompt delivery of the messaging. If a consumer has also ported their lines, it takes a while for the system to search for the right network to send the message…"

Secondly, MAS providers' equipment are affected by the perennial power outages in Nigeria, which further compounds the no-response-to-queries challenge. Thirdly, the proficiency of consumers to use SMS facility on their phone may be low, which contributes to the wrong response challenge.

> SP3: "Issue of the customers sending the wrong pin, as inscribed on the labels thereby prompting error message."

Theme: Fragile business model of MAS provision

Another contributory factor to poor responses to MAS queries may be the current business model for service provision, which appears fragile. Two subthemes emerged for this theme. Firstly, the MAS queries and responses operate on existing GSM infrastructure. The MAS service providers appear to incur enormous cost for using this infrastructure, as it seems that the current business model of the MAS platform yields profit when less than 5% of the codes are queried.

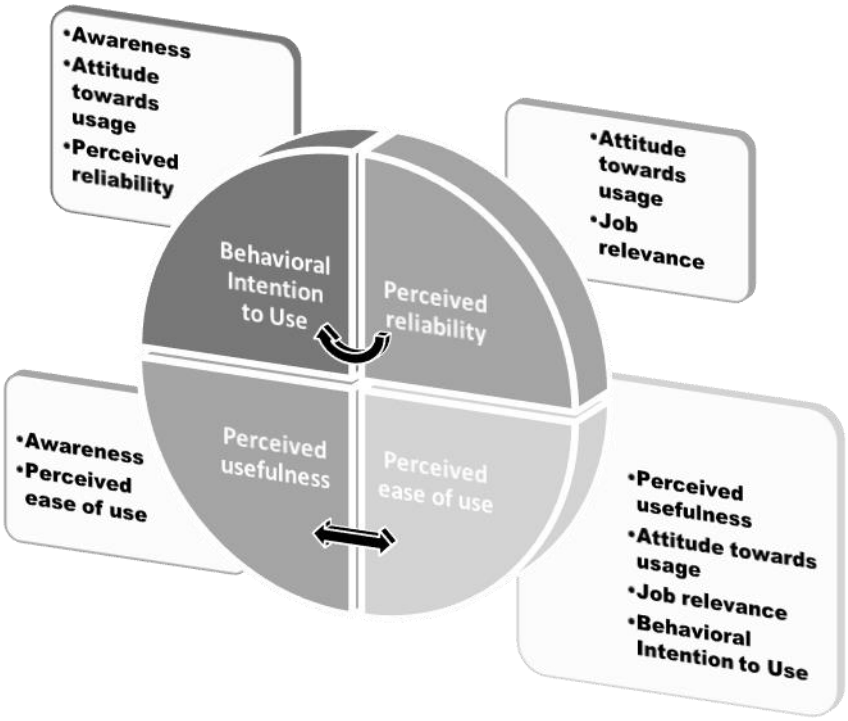

Figure 1. Summary causality/dependencies between the constructs

> SP2: "It is a good technology. However, the economics of the technology is only profitable if less than 5% of codes are queried…"

In addition, the service providers recognise huge telecommunications costs as a challenge, which may have contributed to the inefficiency of their services.

The second subtheme is when pharmaceutical companies may affix MAS codes on distributed medicines packs without activating them by service providers.

> SP3: "The issue of non-activation of code by the service providers before taking it to the market by the pharmaceutical companies"

The fragile business model of service providers might have contributed to the inefficiency of MAS in Nigeria.

Theme: The future: Community pharmacists as MAS champions

To overcome the challenge of no or wrong response, MAS providers described other technological platforms, call centres and web applications, which pharmacists could assess to query their codes. However, these applications might shift cost of sending MAS queries to the consumers rather than to service providers, which may probably boost profits.

> SP1: "In the event that there is no response to the message inquiring about authenticity, it would be best if the pharmacist recommends other channels of verification like placing a phone call to the call centre, verifying through the app or the website. These other channels are just as reliable"

There may be need to engage community pharmacists, as MAS champions, in its future deployment to promote its use on all MAS platforms – SMS, call centres and web applications.

DISCUSSION

This study employs TAM models, modified to include awareness and perceived reliability to help understand and explain behavioural intention of the community pharmacists to use MAS. One of the key findings of this research was that just about half (53%) of the respondents community pharmacists were keen on MAS. This is not surprising because the initial deployment of MAS did not include specific codes for pharmacists' verifications. MAS was designed strictly for consumers to authenticate purchased products. The omission of pharmacists' codes made MAS different from SecurPharm®, which is a pharmacist-driven authentication process.[22] SecurPharm implementation in Germany makes it obligatory for pharmacists to authenticate every medicines before dispensing, for MAS, consumers could not be obligated to use it.[22] A study noted that getting pharmacists' to authenticate medicines may actually improve use of MAS by consumers.[8] The recent revision of MAS implementation guideline seems to have incorporated pharmacists in the MAS process.[6]

The results of the study indicated that both awareness and perceived reliability played an important role in the behavioural intention to use MAS. However, no study was identified that have looked at acceptance of MAS in Nigeria or other climes. Therefore, to improve community pharmacists' MAS acceptance, the National medicine

regulatory authority and MAS providers may need to work on awareness and reliability of MAS.

In addition, it was observed that perceived ease of use is one of the strongest influencers of perceived usefulness. This is consistent with past studies involving TAM constructs i.e. an individual, who perceives a system to be easy to use, is more likely to perceive the system to be useful.[21]

In order to increase the number of community pharmacists who are positively disposed to use MAS, we would recommend a more aggressive MAS awareness campaign, which focuses on its reliability and ease of use.

The findings of the exploration of MAS providers' views revealed that MAS, a complex intervention, appears to have been impacted by the local context, where it was implemented, to produce challenges that may have limited its effectiveness. The context, where a complex intervention is deployed is crucial and may play a role in the success of the intervention.[22,23] The MAS technology is dependent on sending and receiving short message service (SMS) through GSM phones. Therefore, quality of service of the phone companies has direct effect on quality of MAS provided. In Nigeria, though subscription to GSM services is relatively high, 55 million subscribers in 1997, the GSM service efficiency is middling.[24,25] The service efficiency of GSM is plagued by contextual challenges, like instability in power supply, lack of secured infrastructure and technical problems.[24,25] These challenges have impacted MAS deployment in Nigeria.

The success, or not, of MAS to reduce circulation of falsified medicine is currently difficult to quantify because several interventions were implemented about the same time by the regulatory body.[3,5] MAS deployment would have benefited from implementation theories, design of measurable outcomes and process evaluation framework from the initiation, as recommended by the Medical Research Council guidance.[22] The process evaluation framework would identify measurable objective outcomes, which would highlight the mechanisms by which MAS reduces counterfeiting. It is important to explore mechanisms of how interventions, like MAS, bring change or not. This is crucial to understand both how the effects of the specific intervention occurred and how these effects might be replicated by similar future interventions.[26] As NAFDAC considers future deployment, it is important for appropriate framework to be in place to evaluate its impact on counterfeiting.

Successful implementation of technological innovations is closely linked with champions that may actively promote, educate, advocate and make necessary connection between people for the innovations.[27,28] Pharmacists, as champions, were considered crucial in overcoming some barriers to implementation of pharmacy bar codes scanning system in a hospital.[29] Community pharmacists, who are often present at the point of purchase, can actively promote MAS and help consumers navigate the different platforms of MAS queries. This will enhance awareness of consumers about substandard and falsified medicines, as well as improve the use of MAS. This possibility of enhanced use of MAS was reported in a study of MAS.[8]

Substandard and falsified medicines impact community pharmacies' practices negatively, and success of MAS deployment might benefit them, as its efficiency improves. However, the current format of MAS deployment seems to bypass community pharmacists, who have no means of product authentication via MAS platform prior to the time their client use it before payment. So they are often unprepared when clients' authentication attempts fail. Going forward, NAFDAC may need to develop appropriate interventions that will improve MAS acceptance among community pharmacists, as well as involve them as MAS champions.

Limitations

The non-probability sampling methods limit generalization from the study. However, the national coverage for data collection and extant literature support that acceptance of MAS by community pharmacists may not be very high. The use of e-mails, as a means of interview, did not give room for prompt follow-up questions and response is dependent on respondents' ability to write effectively. This, therefore, may have limited the richness of information obtained.

CONCLUSIONS

Acceptance of mobile authentication service by community pharmacists is moderate. The positive influencers of behavioural intention to use MAS are perceived reliability and awareness. Improving community pharmacists' experiences with MAS by involving them in the verification process, as part of their professional obligations, might be crucial. The limitations for MAS deployment from MAS providers' views are mainly contextual: downtime of GSM, power outages and limited ability of consumers' to use SMS. This limitation may be mitigated by getting pharmacists, as MAS champions, to help consumers' navigate other platforms like call centres and web applications for product authentication.

ACKNOWLEDGMENTS

We wish to acknowledge all community pharmacists and Mobile Authentication Service providers in Nigeria, who participated in this study.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING

This research received no specific grant from any funding agency.

References

1. Ozawa S, Evans DR, Bessias S, Haynie DG, Yemeke TT, Laing SK, Herrington JE. Prevalence and estimated economic burden of substandard and falsified medicines in low-and middle-income countries. A systematic review and meta-analysis. JAMA Netw Open. 2018 Aug 3;1(4):e181662. https://doi.org/10.1001/jamanetworkopen.2018.1662
2. World Health Organisation. WHO Global Surveillance and Monitoring System for substandard and falsified medical products. Geneva. Available at: https://www.who.int/medicines/regulation/ssffc/publications/GSMS_Report.pdf?ua=1 Accessed Dec 8, 2018).
3. Spink J, Moyer DC, Rip MR. Addressing the Risk of Product Fraud: A Case Study of the Nigerian Combating Counterfeiting and Sub-Standard Medicines Initiatives. J Forensic Sci Criminol. 2016;4(2):201.
4. Akinyandenu O. Counterfeit drugs in Nigeria: A threat to public health. Afr J Pharm Pharmacol. 2013;7(36):2571-2576. https://doi.org/10.5897/AJPP12.343
5. Iwokwagh NS. Assessment of new media use in the fight against counterfeit medicines in Nigeria. International Conference on Communication, Media, Technology and Design. Famagusta – North Cyprus: 2013. Available at: http://www.cmdconf.net/2013/makale/PDF/5.pdf (accessed Dec 24, 2018).
6. NAFDAC. Guidelines for Procurement and the management of the Mobile Authentication Service (MAS) scheme in Nigeria [Internet]. Abuja: National Agency for Food and Drug Administration and Control; 2018 Available at: https://www.nafdac.gov.ng/wp-content/uploads/Files/Resources/Guidelines/PVG_GUIDELINES/NAFDAC-MAS-Guidelines-Final.pdf (accessed Mar 4, 2019).
7. NAFDAC. Mobile Authentication Service [Internet]. Abuja: National Agency for Food and Drug Administration and Control; 2017 Available at: https://www.nafdac.gov.ng/our-services/pharmacovigilance-post-market-surveillance/mobile-authentication-service-mas/ (accessed 2018 December 24).
8. Ebenezer CJ. Pharmaceutical quality and policy in Nigeria: Stakeholder perspectives and validation of the mobile authentication service [E-Thesis (Doctoral)]. [London, UK]: University College London School of Pharmacy; 2015. 461 p. Available at: http://discovery.ucl.ac.uk/1461259/ (accessed Dec 8, 2018).
9. Oyetunde O, Ilozumba P. Mobile Authentication Service: Curbing circulation of fake Medicines and Assessing Consumer's Response. West African Journal of Pharmacy 2013;24(2):102-108.
10. Aisagbonhi J, Ilomuanya M. Securing the pharmaceutical supply chain: A study of the use of Mobile Authentication Service (MAS) among the Nigerian populace utilizing antimalarials. Afr J Pharm Pharmacol. 2016;10(39):839-848. https://doi.org/10.5897/AJPP2016.4667
11. Eronmhonsele JI. Detecting Counterfeit Drugs through Mobile Authentication Service (MAS): Users' Challenges in Edo South Senatorial District. Int J Pharm Sci Invent. 2015;4 (9):13-18.
12. Ezurum NR. Knowledge, Attitudes and Perception of Consumers in Lagos State On the Effectiveness Of Mobile Authentication Service (M.A.S) As An AntiCounterfeiting Tool. Lagos, Nigeria [Dissertation]; Lagos, Nigeria: West African College of Pharmacy; 2015.
13. Adedini A, Oladehinde S, Oyetunde O. Efficency of mobile authentication service technology on phase 1 enabled drug products - a preliminary study. Nig Q J Hosp Med. 2016;26(1):335-338.
14. Obinna C. Community pharmacists raise alarm over proliferation of fake medicines. Vangurd Newspaper [Internet]. 2015; Available from: http://www.vanguardngr.com/2015/03/community-pharmacists-raise-alarm-over-proliferation-of-fake-medicines/ (accessed Dec 11, 2018).
15. Oladehinde, OA. Pharmacists' acceptance of the Mobile Authentication Service based on technology acceptance model [Thesis (undergraduate)]: Lagos, Nigeria; Faculty of Pharmacy, University of Lagos; 2015.
16. King WR, He, J. A meta-analysis of the technology acceptance model. Inform Manag. 2006;43(6):740-755. https://doi.org/10.1016/j.im.2006.05.003
17. Holden RJ, Brown RL, Scanlon MC, Karsh B. Pharmacy workers' perceptions and acceptance of bar-coded medication technology in a pediatric hospital. Res Social Adm Pharm. 2012;8(6):509-522. https://doi.org/10.1016/j.sapharm.2012.01.004
18. Raosoft sample size calculator. Available at http://www.raosoft.com/samplesize.html (accessed Dec 11, 2018).
19. Murray CD, Sixsmith J. E-mail: a qualitative research medium for interviewing? Int J Soc Res Methodol. 1998;1(2):103-121. https://doi.org/10.1080/13645579.1998.10846867
20. R Core Team. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. Available at: http://www.R-project.org/ (accessed Dec 11, 2018).
21. Tucker LR, Lewis C. A reliability coefficient for maximum likelihood factor analysis. Psychometrika 1973;38(1):1-10.
22. The VFA. securPharm – the new system to prevent falsified medicines from entering the German drug supply chain. Available at: https://www.vfa.de/de/englische-inhalte/securpharm-german-contribution-to-the-upcoming-extended-eu-falsified-medicines-directive (accessed Dec 11, 2018).
23. Gholamreza K, Li Z. Implementation of Technology Acceptance Model (TAM) in Business Research on Web Based Learning System. Int J Innov Technol Explor Engineer. 2014;3(11):2278-3075.
24. Medical Research Council. Developing and Evaluating Complex Interventions: A New Guidance; 2008. http://www.mrc.ac.uk/complexinterventionsguidance (accessed Dec 11, 2018).
25. Datta J, Petticrew M. Challenges to evaluating complex interventions: a content analysis of published papers. BMC Public Health. 2013;13:568. https://doi.org/10.1186/1471-2458-13-568
26. Adegoke A, Babalola I. Quality of service analysis of GSM telephone system in Nigeria. Am J Sci Ind Res. 2011; 2(5):707-712. https://doi.org/10.5251/ajsir.2011.2.5.707.712

27. Adegoke AS, Babalola IT, Balogun WA. Performance evaluation of GSM mobile system in Nigeria. Pacific J Sci Technol. 2008;9(2):436-441.
28. Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, Moore L, O'Cathain A, Tinati T, Wight D, Baird J. Process evaluation of complex interventions: Medical Research Council guidance. BMJ. 2015;350:h1258. https://doi.org/10.1136/bmj.h1258
29. Howell JM, Higgins CA. Champions of Technological Innovation. Adm Sci Q. 1990;35(2):317-341. http://dx.doi.org/10.2307/2393393
30. Shaw EK, Howard J, West DR, Crabtree BF, Nease DE Jr, Tutt B, Nutting PA. The role of the champion in primary care change efforts. J Am Board Fam Med. 2012;25(5):676-685. https://doi.org/10.3122/jabfm.2012.05.110281
31. Nanji KC, Cina J, Patel N, Churchill W, Gandhi TK, Poon EG. Overcoming barriers to the implementation of a pharmacy bar code scanning system for medication dispensing: a case study. J Am Med Inform Assoc. 2009;16(5):645-650. https://doi.org/10.1197/jamia.M3107

https://doi.org/10.18549/PharmPract.2019.2.1452

Original Research

The provision of advice by pharmacy staff in eastern Indonesian community pharmacies

Cecilia BRATA, Carl R. SCHNEIDER, Brahmaputra MARJADI, Rhonda M. CLIFFORD.

Received (first version): 16-Jan-2019 Accepted: 12-May-2019 Published online: 3-Jun-2019

Abstract

Background: Indonesian community pharmacies hold a strategic position from which to promote the rational use of medicines by providing appropriate advice for patients requesting self-medication. To date, published studies related to the provision of advice in Indonesian community pharmacies are limited and have been conducted only in more developed western Indonesia. No studies have been undertaken in eastern Indonesia, which is less developed than and culturally different from the western region.

Objectives: This paper aims to: (1) describe the types and amount of advice provided by pharmacy staff for three scenarios in a patient simulation study and for two scenarios in pharmacy staff interviews; and (2) ascertain the frequency of appropriate advice given in response to the scenarios.

Methods: A patient simulation study was conducted at community pharmacies in an eastern Indonesian provincial capital. Four weeks after completing a patient simulation study, structured interviews with pharmacy staff were conducted. Two cough scenarios and one diarrhoea scenario were developed for the patient simulation study. Meanwhile, two scenarios (an ACE inhibitor-induced cough and a common cough and cold) were developed for pharmacy staff interviews. The types and amount of advice provided by pharmacy staff were recorded on paper and assessed for its appropriateness. The determination of appropriate advice was based on the literature and by consensus of two Indonesian experts.

Results: In patient simulation, the most common type of advice provided in all scenarios was product recommendations. In interviews, medical referrals and recommending cough and cold medicine were the most common types of advice provided for ACE inhibitor-induced cough and common cough and cold scenarios respectively. Appropriate advice was provided in less than 0.5% in the patient simulation study, but two-third of participants in the interviews responded to the scenarios appropriately.

Conclusions: Pharmacy staff did not provide appropriate advice in practice, although they may have adequate knowledge. A contributing factor was insufficient information gathered in patient encounters. Optimising information-gathering practice by pharmacy staff is needed.

Keywords

Community Pharmacy Services; Counseling; Self Medication; Professional Practice; Pharmacies; Pharmacists; Patient Simulation; Surveys and Questionnaires; Indonesia

INTRODUCTION

The irrational use of medicines, i.e., the situation where "medically inappropriate, ineffective, and economically inefficient use of medicine occurs in health care facilities" , is a worldwide problem.[1] Rational use is defined by the World Health Organization (WHO) as when "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community".[2] The irrational use of medicines can occur at any stage of medicine use cycle, starting from the stage of diagnosis, prescribing, dispensing, and patient adherence.[3] The irrational use of medicines increases health care costs, decreases the quality of drug treatment, and increases the likelihood of adverse drug reactions; it is also regarded as the primary cause of antibiotic resistance worldwide.[4] Inappropriate self-medication practice is a significant contributory factor to the irrational use of medicines.[4]

Self-medication is defined by the WHO as "the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms".[5] Self-medication is prevalent in developing countries, and community pharmacies are important sources of medicines for patients who self-medicate.[6,8-10] Studies have shown that community pharmacists' interventions (such as by providing quality consultation) can improve patient outcomes, prevent harms, and encourage rational use of medicines for self-medication practice.[11-14] In Indonesia, 2013 data show that 91% of Indonesians practised self-medication, and almost 80% of Indonesians obtained medicines from community pharmacies or other private medicine sellers such as corner shops and market stalls.[15,16] While these other private medicine sellers have a role in the distribution of medicines for self-medication in Indonesia, community pharmacies are formally registered by the Health Department and therefore more controlled. Thus, in the short term, from a public health perspective, it is easier to intervene and improve the provision of quality consultation by community pharmacy staff to patients with self-medication requests than other private medicine sellers for the benefit of the health care for the public.[17]

Self-medication consultations in community pharmacies consist of two sequential stages: patient assessment; and the provision of advice.[18-20] The patient assessment stage

Cecilia BRATA. Centre of Medicine Information and Pharmaceutical Care, University of Surabaya, Surabaya (Indonesia). cecilia.brata@gmail.com
Carl R. SCHNEIDER. Faculty of Pharmacy, University of Sydney. Sydney, NSW (Australia). carl.schneider@sydney.edu.au
Brahmaputra MARJADI. School of Medicine, University of Western Sydney. Sydney, NSW (Australia). B.Marjadi@westernsydney.edu.au
Rhonda M. CLIFFORD. School of Medicine and Pharmacology, University of Western Australia. Perth, WA (Australia). rhonda.clifford@uwa.edu.au

includes information-gathering and analysis of the information gathered. Based on the patient assessment, the pharmacist then needs to provide appropriate advice to the patient. The advice provided may be: a referral for medical assessment; recommendations of appropriate medicine(s), including associated medicine information; recommendations of non-pharmacological treatment(s); or other advice relevant to patients' needs.

We have reported the process of information-gathering and its related factors in the same setting, i.e., community pharmacies in an eastern Indonesian capital city.[21] Our results suggested that the information gathered was not sufficient to provide appropriate advice, and that pharmacist involvement was associated with higher amount of information gathered. This article addresses the next step in self-medication consultations in community pharmacies, which is the advice-provision by pharmacy staff. The objectives of this article are to:

1. Describe the types and amount of advice provided by pharmacy staff for three scenarios (related to cough and diarrhoea) in a patient simulation study and for two scenarios (related to cough) in pharmacy staff interviews.
2. Ascertain the frequency of appropriate advice given in response to the self-medication request scenarios

METHODS

The present study was conducted in conjunction with our previously published study.[21] This study was conducted in all community pharmacies (based on the registry of the local Department of Health and lists from pharmaceutical wholesalers) in a provincial capital of Eastern Indonesia (population around 400.000 people). This site was particularly chosen because it can be considered representing the situation of Eastern Indonesia (i.e., less-developed area of the country and has lower health care resources compared to the western part).[22]

This study uses a combination of patient simulation and structured, face-to-face interviews with pharmacy staff using self-medication scenarios. Covert patient simulation was used in order to minimise Hawthorne effect (i.e., an improvement in the performance resulting from awareness that they are being studied). Although no consent was obtained in the patient simulation study, there is no risk to an individual pharmacy since only pooled data were presented. Ethics approval was obtained from the Human Research Ethics Committee of the University of Western Australia and the provincial chapter of the Indonesian Pharmacists Association.

Patient simulation

Two scenarios (one symptom-based and one product-based) related to angiotensin-converting enzyme (ACE) inhibitor-induced cough and one scenario related to a symptom-based request for childhood diarrhoea were used. These cough and diarrhoea scenarios were chosen because they are common symptoms with which patients often practise self-medication and present to pharmacies for treatment.[23] The scenarios were developed by the first author (CB) based on the relevant literature, were reviewed by pharmacy academics and practitioners in Indonesia and Australia, and were pilotted in 5 to 10 pharmacies before use.[19,24,25] Details of the scenarios have been described in a previous publication and represented in Table 1.[21]

Table 1. Scenarios in patient simulation study

Patient simulation scenarios	Appropriate advice*
Symptom and product-based requests for Ace inhibitor-induced cough On entering the pharmacy, one of the simulated patients said: "What is a good cough medicine that you recommend?" (for symptom based requests) or "I want to buy Woods merah#" (for product based requests) ***Only upon questioning, this information was provided:*** The patient is the one who has cough. He/she has been coughing for 4 weeks. The cough is dry, irritating and occurs constantly. There are no accompanying symptoms. The patient has tried Bisolvon syrup two weeks ago, but did not work. The patient was diagnosed with hypertension 2 months ago and routinely consumes captopril 25 mg three times a day. The patient does not have any medical condition other than hypertension and did not routinely consume any medicines, supplements, or herbal medicines other than captopril. The patient does not smoke and is not a passive smoker. The patient exercises regularly and follows healthy diet. The Blood pressure is controlled (~130/80) and the patient does not have any allergies.	Medical referral without recommending medicines.[19,31,34]
Symptom based requests for simple acute childhood diarrhoea On entering the pharmacy, one of the simulated patients said: "My child has diarrhoea, what do you recommend?" ***Only upon questioning, this information was provided:*** The patient is 4 year old, weight ± 20 kg, height: ± 1 metre. The patient has acute onset of simple diarrhoea. The diarrhoea started about 6 hours ago. The patient has gone to the toilet three times. The consistency of the stool was mushy, softer than usual. The patient is generally well, still can play around. The patient is not restless, not irritable, not lethargic, and still has normal drinking habit. The patient has no accompanying symptoms and has not taken any medicines for diarrhoea. The patient has no other medical conditions and does not routinely take any other medications, supplements or herbal. The patient does not have any allergies.	Recommending oral rehydration salts and zinc.[25,69] Providing antibiotics or antidiarrhoeals for this scenario was considered inappropriate.[25]
#Woods merah is one of the Indonesian brand names of cough medicines that containes Dextromethorphan HBr and Doxylamine. *Appropriate advice was determined based on the literature and by consensus of two Indonesian senior lecturers in pharmacy practice	

Six simulated patients were trained by one researcher (CB) and visited each pharmacy in pairs. One simulated patient acted out the scenarios and the other observed the encounter; both independently completed a data collection form at the end of the encounter, out of sight of pharmacy staff. A Kappa statistic was calculated to measure inter-rater reliability between the two simulated patients in each pair. Any discrepancies were discussed between the simulated patient pairs until a consensus was reached for each encounter. The professional background of staff in the patient simulation study was not recorded because the identity of the staff could not be ascertained without jeopardising the simulation. Thus, whether our simulated patients encountered the same or different staff during the visits could not be ascertained.

The types and amount of advice provided by pharmacy staff were analysed descriptively. The types of advice provided were categorised as medical referral, product recommendation, medicine information, non-pharmacological advice, and other advice. The advice provided by pharmacy staff was then assessed for its appropriateness as stated in Table 1.

Interviews

Face-to-face, structured interviews were conducted four weeks after the completion of the patient simulation study. First, consenting pharmacy managers were interviewed regarding the characteristics of their pharmacy. The managers were then asked to indicate their staff whose job descriptions included serving patients requesting self-medication and for permission to interview these staff. A researcher (CB) then approached all eligible staff members and offered them to voluntarily participate in an interview. The eligible staff included those who were observed in the patient simulation study; however, since their details were not recorded during patient simulation visits, any overlapping staff between the two studies could not be ascertained.

Consenting participants were asked about their demographic characteristics and asked to describe the advice they would provide for two hypothetical cough scenarios (Table 1). The first scenario was an ACE inhibitor-induced cough adapted from the scenario used in the patient simulation study. The second hypothetical scenario was a common cough and cold, adopted from Blenkinsopp *et al*. (Table 1).[19] For each scenario, complete information related to patient identity, sign and symptoms, medical history, and current medication used were provided to the participants. For practical reason (i.e., to limit the length of interview), we only used scenarios related to cough; one scenario (the ACE inhibitor scenario) would need a medical referral and the other (the common cough and cold) would need a product recommendation or non-pharmacological advice. All scenarios were validated by Indonesian and Australian pharmacy academics and practitioners, and were pilotted before use. Details of the development, validation, and piloting of the questionnaire have been described previously.[21]

All participants were interviewed individually in a private place in the pharmacy. The interviewer (CB) read the scenarios as stated in Table 1 and recorded participants' answers on the questionnaire sheet. Description of the two cough scenarios was also provided in a piece of paper to all participants.

Descriptive statistics were used to summarise data related to pharmacy and pharmacy staff characteristics. Quantitative content analysis was used to analyse the types of advice provided by participants in the two hypothetical scenarios.[20,21,26,27] A categorisation matrix was firstly created using both deductive and inductive techniques as described by Elo and Kyngas.[28] The matrix was developed deductively based on literature; and then re-modified using an inductive technique after preliminary reading of all data.[19,29] Next, two coders independently coded the data for correspondence with the modified categorisation matrix. Frequencies were calculated for each code and the Kappa statistic was calculated to assess the inter-rater reliability between the coders.

The advice provided by pharmacy staff for these scenarios was assessed for appropriateness. The determination of appropriate advice was based on the literature (Table 2), and by consensus of two Indonesian senior lecturers in pharmacy practice.

RESULTS

Study participants

Patient simulation; The total population of the pharmacies visited was 78 pharmacies for the two cough scenarios and increased to 81 pharmacies for the diarrhoea scenario. Differences in the total population of pharmacies were due to the opening of 3 new pharmacies. Data collection was conducted at 2 different times. The first round of data

Table 2. Scenarios in structured interview study

Structured interview hypothetical scenarios	Appropriate advice*
ACE inhibitor-induced cough scenario A woman, aged about 60 years old, comes into this pharmacy and asks you for a recommendation for her cough. The woman says that she has experienced non-productive cough constantly over the last 4 weeks. She has tried Bisolvon elixir for her cough but it did not help. The woman tells you that she was diagnosed with hypertension 2 months ago. Her daily medication is captopril 25mg, three times a day, which she has taken for 2 months. What would you advise this woman?	Medical referral without recommending medicines.[19,31,34]
Common cough and cold scenario A young man, aged 25, asks if you can recommend something for his cough. He sounds as if he has a cold and looks a bit pale. He has been coughing for about 2-3 days. His cough is productive and the sputum is clear. He has a blocked nose and a mild sore throat. He has no pain on breathing, no shortness of breath, and no fever. He has not tried any medicines for his symptoms. He is not routinely taking any supplement, herbal, or any other medications. What would you advise this man?	Recommending appropriate products (i.e., cough and cold preparation) and/or non-pharmacological advice (e.g., fluid intake, resting).[19,70,71]

#Woods merah is one of the Indonesian brand names of cough medicines that containes Dextromethorphan HBr and Doxylamine.
*Appropriate advice was determined based on the literature and by consensus of two Indonesian senior lecturers in pharmacy practice.

Table 3. Pharmacy and pharmacy staff characteristics

Pharmacy characteristics	**n=69 (%)**	
Pharmacy type		
Attached to doctor's clinic	50	(72%)
Not attached to doctor's clinic	19	(28%)
Pharmacy ownership		
Pharmacist	7	(10%)
Non-pharmacist	60	(87%)
Other (i.e., joint business of pharmacist and non-pharmacist)	2	(3%)
Estimated total patients served per day*	4595	
Estimated total patients served for self-medication per day*	2975	
Average pharmacy opening hours per week (hours)	90	SD 31
Total number of staff employed in the 69 pharmacies surveyed	352	
Total number of pharmacists	75	
Total number of pharmacy technicians	86	
Total number of staff without formal education in pharmacy	191	
Total staff working hours per week (hours)		
Pharmacists	1270	
Pharmacy technicians	3542	
Other staff without formal education in pharmacy	8973	
Pharmacy staff characteristics	**n=173 (%)**	
Professional background		
Pharmacists[$]	42	(24%)
Pharmacy technicians^	32	(19%)
Staff without formal educational backgrounds in pharmacy	99	(57%)
Age (years; mean)	30	SD 7.8
Gender: female	140	(81%)
Working experience (years; median, IQR[#])	3	IQR=1.5–7
Ever attended training on self-medication after graduation from the highest education qualification		
Yes	19	(11%)
No	154	(89%)

* calculated from 67 pharmacies; there were missing data from 2 pharmacies for these questions
[$] A pharmacist in Indonesia is a person who has a bachelor degree in pharmacy and holds a pharmacist registration training certificate.
^ A pharmacy technician in Indonesia is a person who has graduated from pharmacy assistant school or has a three year diploma in pharmacy or a person who has a bachelor degree in pharmacy without holding a pharmacist registration training certificate.
# IQR = Interquartile range.

collection using two cough scenarios was conducted in June 2011 to August 2011. The second round of data collection using the diarrhoea scenario was conducted in May 2012. Data were collected from 76/78 pharmacies for the symptom-based request for cough; 69/78 pharmacies for the product-based requests for cough; and 80/81 pharmacies for the childhood diarrhoea scenario. In total, 12 visits for the three scenarios were not performed because the pharmacies were closed when visited or the simulated patients were known to the pharmacy staff on duty, which prohibited the simulation.

Pharmacy staff interviews: The interview was conducted four weeks after completing patient simulation study (around June 2012). Sixty nine out of the 81 pharmacies agreed to participate, with 173/237 eligible pharmacy staff consenting to be interviewed. Reasons for refusal were not asked to avoid a perceived coercion to participate.

Reliability

Patient simulation: The Kappa statistic for the simulated patient pairs ranged from 0.88 to 1, with each item having a p-value <0.0005, indicating very good reliability.[30]

Pharmacy staff interviews: The Kappa statistics between the two coders for the ACE inhibitor-induced cough scenario and the common cough and cold scenario were 0.85, p<0.0005 and 0.97, p<0.0005 respectively, indicating very good reliability.[30]

Pharmacy and pharmacy staff characteristics

Characteristics of the participating pharmacies and pharmacy staff are presented in Table 3. Most of the pharmacies (87%) were owned by non-pharmacists and staffing was dominated by staff who did not have any educational background in pharmacy. About 65% of patients coming to pharmacy were served for self-medication per day. The majority (57%) of participants who served patients with self-medication requests, however, were staff without formal education in pharmacy. Pharmacists and pharmacy technicians were only accounted for 24% and 19% of the interviewees respectively. Almost 90% of the participants interviewed never attended any training on self-medication after graduating from school.

Types and amount of advice provided

Patient simulation: The types and amount of advice provided by pharmacy staff when responding to the scenarios are presented in Table 4. In the symptom-based request scenario for ACE inhibitor-induced cough, the majority of pharmacy staff (75/76, 99%) recommended medicines, of which 55/75 (73%) were antitussive. Medicine information, however, was provided in only 17/76 encounters (22%), while direct medical referral was provided in only 1/76 (1%) encounters.

Table 4. The types and amount of advice provided from patient simulation study

The types of advice provided	Symptom-based requests for ACE inhibitor-induced cough (n=76)		Product-based requests for ACE inhibitor-induced cough (n=69)		Symptom-based requests for a simple, acute childhood diarrhoea (n=80)	
Medical referral	5	(7%)*	0	(0%)	15	(19%)[$]
Product recommendation	75	(99%)	64	(93%)^	65	(81%)
Medicine information	17	(22%)	0	(0%)	46	(58%)
• The purpose of treatment	1	(1%)	0	(0%)	0	(0%)
• How to use the medicine(s)	13	(17%)	0	(0%)	29	(36%)
• Duration of treatment	0	(0%)	0	(0%)	2	(3)%
• The purpose of treatment and how to use the medicine(s)	3	(4%)	0	(0%)	3	(4%)
• How to use the medicine(s) and duration of treatment	0	(0%)	0	(0%)	10	(13%)
• The purpose of treatment, how to use the medicine(s), and duration of treatment	0	(0%)	0	(0%)	2	(3%)
• Possible side effects	0	(0%)	0	(0%)	0	(0%)
Non-pharmacological advice	1	(1%)	0	(0%)	5	(6%)
Other						
• The product requested was not available and no advice was provided.	0	(0%)	5	(7%)	0	(0%)

*Total includes one encounter with medical referral only and four where medical referral was recommended as a follow up (i.e., if symptom persisted after using the medication recommended).
[$] In all 15 encounters, medical referral was the only advice provided.
^ The percentage of pharmacy staff selling the requested product.

In the product-based request scenario for ACE inhibitor-induced cough, 64/69 encounters (93%) resulted in supplying the requested product, while in the remaining 5/69 encounters (7%) the product requested was not available. None of pharmacy staff recommended medical referral, provided medicine information, or gave non-pharmacological advice.

In the childhood diarrhoea scenario, staff in 65/80 encounters (81%) recommended medicines, with 46/65 (71%) providing some form of medicine information. Direct medical referral was recommended in 15/80 encounters (19%). Non-pharmacological advice related to fluid intake was provided in only 5/80 encounters (6%).

Pharmacy staff interviews: The types and amount of advice provided for the two hypothetical scenarios in cough are presented in Table 5. In the ACE inhibitor-induced cough scenario, the majority of pharmacy staff (138/173, 80%) recommended direct medical referral. In the common cough and cold scenario, the majority of pharmacy staff (154/173, 89%) recommended products.

The provision of appropriate advice

Patient simulation: Only one pharmacy staff member across all scenarios provided appropriate advice: 1/76 (1%) and 0/69 respectively in symptom- and product-based requests for ACE inhibitor-induced cough scenarios, and 0/80 in the childhood diarrhoea scenario (Table 6). None of the products supplied in the childhood diarrhoea scenario were appropriate. Antibiotics and antidiarrhoeals were the most common types of products recommended in this scenario, in 45% and 36% of the 80 encounters, respectively. Oral rehydration salts and zinc were recommended in 5% and 15% of the 80 encounters respectively, but these products were supplied with either antibiotics or antidiarrhoeals; and therefore the overall advice was determined inappropriate.

Table 5. The types and amount of advice provided for the two hypothetical scenarios from interview data.

The types of advice recommended by pharmacy staff interviewed	ACE inhibitor-induced cough scenario (n=173)		Common cough and cold scenario (n=173)	
Medical referral				
• Medical referral	138	(80%)	16	(9%)
• Medical referral as a follow up (i.e., if symptom(s) persists or worsens after trying the recommended product or after going for laboratory check-up)	6	(3%)	36	(21%)
Product recommendation	29	(17%)	154	(89%)
Medicine information (i.e., how to use the medicines)	1	(1%)	0	(0%)
Non-pharmacological advice	4	(2%)	11	(6%)
Other:				
• Advising to stop ACE inhibitor if the patient has normal blood pressure.	1	(1%)	N/A	
• Advising the patient to have laboratory check-up (i.e., blood check, sputum check, or chest x-ray).	3	(2%)	2	(1%)
• Did not know what advice to be provided; and therefore will call the pharmacist or technician to handle the patient.	9	(5%)	4	(2%)

N/A = Not applicable

Table 6. The proportion of pharmacy staff who provided appropriate advice

Scenarios	Patient simulation study	Pharmacy staff interviews
ACE inhibitor-induced cough		
Symptom-based requests	1 of 76 encounters (1%)	132 of 173 interviewees (76%)
Product-based requests	0 of 69 encounters (0%)	N/A
Childhood diarrhoea	0 of 80 encounters (0%)	N/A
Common cough and cold	N/A	118 of 173 interviewees (68%)

N/A = Not applicable

Pharmacy staff interviews: Appropriate advice was provided by 132/173 (76%) interviewees in the ACE inhibitor-induced cough scenario and 118/173 (68%) interviewees in the common cough and cold scenario (Table 6). Of the 138 participants who recommended medical referral in the ACE inhibitor-induced cough scenario (Table 5), there were 6 participants who also recommended product or laboratory check and therefore were considered inappropriate; resulting in 132 participants recommended appropriate advice. Meanwhile, of the 154 participants who recommended products in the common cough and cold scenario (Table 4), 120 participants recommended an appropriate product, while 34 recommended antibiotics or oral steroids that were considered inappropriate. Two of these 120 participants recommended direct medical referral in addition to recommending product(s), which was considered inappropriate. As a result, a total of 118/173 interviewees (68%) recommended appropriate advice.

DISCUSSION

Our patient simulation study, using the three scenarios described, alarmingly indicates that appropriate advice is rarely provided by pharmacy staff. In the ACE inhibitor-induced cough scenarios, a medical referral was necessary to enable the ACE inhibitor to be changed to an alternative antihypertensive agents.[31,32] Almost all pharmacy staff encountered by the simulated patients did not provide medical referral and recommended inappropriate products. This indicates a failure to adequately identify adverse drug reactions (ADR) and provide correct advice to resolve the ADR. Low awareness and failure to recognise a cough as a side effect of ACE inhibitor by health care professionals has also been reported in the past literature.[33-36] Such inappropriate advice could lead to more problems such as ineffective cough products being used by patients, or delaying medical treatment of the underlying condition.[33,34] In the simulated acute simple childhood diarrhoea scenario, inappropriate products such as antibiotics and antidiarrhoeals were commonly recommended. This finding is similar to those of other studies in developing countries.[37-41] The use of unnecessary medicines in this diarrhoea scenario not only increases the cost of treatment but also exposes patients to the possibility of experiencing adverse drug reactions.[42,43] Moreover, inappropriate use of antibiotics increases the risk of bacterial resistance which is related to an increase in morbidity, mortality, and health care costs.[44]

One of the factors that may cause inappropriate advice being provided by pharmacy staff in the simulation study is probably related to inadequate information-gathering, as reported in our previous study.[21] In the symptom-based request for cough scenario, only information related to the nature of cough was asked by the majority of pharmacy staff; the key information which is current medication used, was not asked.[21] In the product-based request for cough scenario, almost all pharmacy staff did not ask any questions.[21] Therefore, inappropriate advice was provided for the two cough scenarios, as stated in the results of this article. In the diarrhoea scenario, the majority of pharmacy staff only asked about patient identity and only a third asked about information related to signs and symptoms.[21] Incomplete information gathered seems to be an important factor causing inappropriate advice provided in this diarrhoea scenario, although other factors, such as product advertising, prescribing practices of local doctors, drug company sales information, knowledge of pharmacy staff and business interests may also be the reasons of inappropriate advice in the diarrhoea scenario.[38,42]

Our finding that the most common type of advice provided in the three simulated scenarios used was product recommendation is similar to findings from other patient simulation studies in developing countries.[41,45-47] Although pharmacy staff often recommended products, they did not provide comprehensive medicine information, as required by the practice guideline set out by the Indonesian Pharmacy Service Standard.[48] This guideline requires pharmacy staff to provide patients requesting self-medication with information on: the name of medicine(s); the purpose of treatment; how to use the medicine(s); duration of treatment; and possible side effects.[48] The failure of pharmacy staff to provide sufficient medicine information may cause patients to use medicines inappropriately, especially because patients' understanding of medicines and medical treatment is highly variable, and there are deficiencies in patients' knowledge regarding medicine use.[49-52] Since medicine information may improve patient knowledge and help patients use medicines appropriately, it is important to ensure that pharmacy staff provide sufficient medicine information in their daily practice.[53-55]

In contrast with the results of the patient simulation study, the majority of staff from the same pharmacies claimed to provide appropriate advice during the interview study. This finding of more appropriate advice being reported in interviews than actually provided in patient simulations mirrors the findings of past studies.[42,46] An important factor that causes this difference in this setting might be due to pharmacy staff incompletely gathering patient information in the patient simulation study, whereas complete patient information was provided in the questionnaire.[21] Since the amount of information gathered correlates positively with the provision of appropriate advice, pharmacy staff as well as the Indonesian professionals, regulatory, and educating bodies need to improve the quality of information-gathering practice when handling self-medication requests.[56,57] The leaders in the pharmacy (involving the

Indonesian Pharmacists Association, the Indonesian Pharmacy Assistants Association, the Ministry of Health, and the Association of Indonesian Pharmacy Higher Education) should focus on identifying, developing and implementing sustainable intervention strategies to improve the quality of information-gathering practice.

In addition to inadequate information gathering, there could be other factors that may influence the provision of quality self-medication services. The lack of involvement of trained staff in the provision of self-medication services as found in our study (Table 3) might be one of the factors contributing to the suboptimal advice provided. Data from our interviews showed that the majority (57%) of staff who provided services for self-medication requests in this site were staff without formal education in pharmacy (Table 3). This probably happened because pharmacy owners did not employ enough pharmacists and/or pharmacy technicians and therefore they rarely involved in the provision of self-medication services albeit their pharmacy education. The lack of involvement of pharmacists in the provision of self-medication services has been reported in other studies.[58-60] Theoretically, the rare involvement of trained staff in services for self-medication may put a higher risk of patients using medicines inappropriately. Furthermore, the literature has also reported other factors that may influence the provision of quality self-medication, including: lack of sufficient time to counsel patients with minor queries because the pharmacists were busy with the prescription, lack of adequate skills and knowledge to provide self-medication counseling, lack of support from the pharmacists professional body, lack of implementation of existing legislation, negative attitudes of pharmacy staff (focusing on short-term profit rather than patients), and lack of remuneration for minor queries.[60-64]

Our findings of sub-optimal practices in self-medication consultations at community pharmacies are of concern because pharmacies are important sources of medicines for Indonesians who self-medicate.[16] Community pharmacies are highly accessible by the community and pharmacy staff are in a strategic position from which to advise patients on their medications.[65] There is a clear need for further research to be conducted to determine the cause(s) of the problem of inappropriate provision of advice by community pharmacy staff, as there could be other contextual factors that influence the provision of advice that have not been identified. Literature from other developing countries has shown that the reasons for the poor quality of health services are often complex and multi-factorial.[66,67] There are many contextual factors, such as the health care system and socio-cultural differences that can influence the current practice.[66,68] Successful strategies for practice improvement would need to take such factors into consideration.

Limitations

As both our patient simulation and pharmacy staff interview studies were confined to only a few scenarios, our findings may not be generalisable to advice provision for all self-medication requests. Future research involving a wider range of scenarios would enable a more comprehensive assessment of the ability of pharmacy staff in handling self-medication requests. Furthermore, we were unable to identify whether the staff who were observed in patient simulation were subsequently interviewed. It is possible that the staff who volunteered for interviews were more confident in their ability to answer the scenarios and therefore provided more appropriate advice. This selection bias may partly explain discrepancy of the findings between patient simulations and interviews.

In the interviews, 12/81 pharmacies and 64/237 eligible participants did not participate. Thus, there was possibility of non-participants not sharing the same response to the hypothetical scenarios provided (i.e., non-response bias). However, from personal observation there was no difference in the characteristics of the pharmacies and pharmacy staff that declined participating. In addition, this study also could not establish to what extent good knowledge enables pharmacy staff to provide appropriate advice. For example, in the ACE inhibitor-induced cough scenario, it was unclear whether medical referral was recommended because pharmacy staff knew that the cough was caused by the ACE inhibitor or because pharmacy staff was afraid to recommend products of which they had limited knowledge. There is a need for a further research in this setting on the level of knowledge of pharmacy staff relating to minor ailments.

CONCLUSIONS

A majority of pharmacy staff in this eastern Indonesian setting provided appropriate advice to self-medicating patients in interviews but not to simulated patients. This could imply that pharmacy staff did not translate their knowledge to practice. Insufficient information-gathering was identified as a contributing factor to inappropriate advice. Therefore, improving information-gathering practice by pharmacy staff is required. The leaders in the Indonesian pharmacies need to develop and implement strategies to improve the practice of pharmacy staff, particularly information-gathering when providing self-medication services.

ACKNOWLEDGEMENTS

We thank our participants for taking part in this study. We also thank the local Indonesian Pharmacy Association and the local Department of Health for providing approval and access for data collection.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

FUNDING

This project was funded by the Australian Department of Foreign Affairs and Trade award scholarships.

References

1. World Health Organization. Session Guide- Problems of irrational drug use. 2000; http://archives.who.int/PRDUC2004/RDUCD/Session_Guides/problems_or_irrational_drug_use.htm (accessed Mar 3, 2019).
2. World Health Organization. Promoting rational use of medicines: core components. 2002; http://apps.who.int/medicinedocs/pdf/h3011e/h3011e.pdf (accessed Jan 1, 2019).
3. Ofori-Asenso R, Adom AA. Irrational use of medicines-A summary of key concepts. Pharmacy. 2016;4(4):35. https://doi.org/10.3390/pharmacy4040035
4. World Health Organization. Managing for Rational Medicine Use. 2012; http://apps.who.int/medicinedocs/documents/s19604en/s19604en.pdf (accessed Jan 4, 2019).
5. World Health Organization. The role of the pharmacist in self care and self medication. 1998; http://apps.who.int/medicinedocs/pdf/whozip32e/whozip32e.pdf (accessed Jan 4, 2019).
6. Hassali MA SA, Al-Qazaz H, Tambyappa J, Palaian S, Hariraj V. Self-medication practices among adult population attending community pharmacies in Malaysia: an exploratory study. Int J Clin Pharm. 2011;33(5):794-799. https://doi.org/10.1007/s11096-011-9539-5
7. Awad AI, Eltayeb IB, Capps PA. Self medication practices in Khartoum State, Sudan. Eur J Clin Pharmacol. 2006;62(4):317-324. https://doi.org/10.1007/s00228-006-0107-1
8. Sawalha A. A descriptive study of self medication practices among Palestinian medical and nonmedical university students. Res Social Adm Pharm. 2008;4(2):164-172. https://doi.org/10.1016/j.sapharm.2007.04.004
9. Agbor MA, Azodo C. Self-medication for oral health problems in Cameroon. Int Dent J. 2011;61(4):204-209. https://doi.org/10.1111/j.1875-595X.2011.00058.x
10. Sihavong A, Lundborg C, Syhakhang L, Akkhavong K, Tomson G, Wahlstrom R. Antimicrobial self medication for reproductive tract infections in two province in Lao People's Democratic Republic. Sex Transm Infect. 2006;82(2):182-186. https://doi.org/10.1136/sti.2005.016352
11. Hoffmann W, Herzog B, Muhlig S, Kayser H, Fabian R, Thomsen M, Cramer M, Fiss T, Gresselmeyer D, Janhsen K. Pharmaceutical care for migraine and headache patients: a community-based, randomized intervention. Ann Pharmacother. 2008;42(12):1804-1813. https://doi.org/10.1345/aph.1K635
12. Krishnan HS, Schaefer M. Evaluation of the impact of pharmacist's advice giving on the outcomes of self-medication in patients suffering from dyspepsia. Pharm World Sci. 2000;22(3):102-108.
13. Williams KA, Emmerton LM, Taylor R, Werner J, Benrimoj SI. Non-prescription medicines and Australian community pharmacy interventions: rates and clinical significance. Int J Pharm Pract. 2011;19(3):156-165. https://doi.org/10.1111/j.2042-7174.2010.00091.x
14. Westerlund LT, Marklund BR, Handl WH, Thunberg ME, Allebeck P. Nonprescription drug-related problems and pharmacy interventions. Ann Pharmacother. 2001;35(11):1343-1349. https://doi.org/10.1345/aph.1A065
15. Badan Pusat Statistik. Statistical yearbook of Indonesia 2014. 2014; http://www.bps.go.id/website/pdf_publikasi/watermark%20_Statistik_Indonesia_2014.pdf (accessed Jan 4, 2019).
16. Kementrian Kesehatan Republik Indonesia. Riset Kesehatan Dasar 2013. 2013; http://www.depkes.go.id/resources/download/general/Hasil%20Riskesdas%202013.pdf (accessed Jan 4, 2019).
17. Chee G, Borowitz M, Barraclough A. Private Sector Health Care in Indonesia. 2009; http://pdf.usaid.gov/pdf_docs/Pnadq842.pdf (accessed Jan 4, 2019).
18. Brata C, Schneider CR, Everett A, Fisher C, Clifford RM. A review of the information-gathering process for the provision of medicines for self-medication via community pharmacies in developing countries. Res Social Adm Pharm. 2013;9(4):370-383. https://doi.org/10.1016/j.sapharm.2012.08.001
19. Blenkinsopp A, Paxton P, Blenkinsopp J. Symptoms in the Pharmacy A Guide to the Management of Common Illness. 6th ed. West Sussex: Wiley-Blackwell; 2009.
20. Brown L, Issets B. Patient assessment and consultation. In: Berardi RR, Ferreri SP, Hume AL, Kroon LA, Newton GD, Popovich NG, Remington TL, Rollins CJ, Shimp LA, Tietze KJ, et al., eds. Handbook of nonprescription drugs: An interactive approach to self care. Washington DC: American Pharmacists Association; 2009:21-25.
21. Brata C, Marjadi B, Schneider CR, Murray K, Clifford RM. Information-gathering for self-medication via Eastern Indonesian community pharmacies: a cross-sectional study. BMC Health Serv Res. 2015;15:8. https://doi.org/10.1186/s12913-014-0670-6
22. Rosmeli, Nurhayani. [Comparative study of regional inequality between the western region of Indonesia and Eastern Indonesia]. Mankeu. 2014;3(1):374-463.
23. Hermawati D. Pengaruh edukasi terhadap tingkat pengetahuan dan rasionalitas pengunjung obat swamedikasi di dua apotek kecamatan Cimaggis, Depok. [Bachelor of Pharmacy Thesis]. Jakarta, Universitas Indonesia; 2012.
24. Tietze KJ . Cough. In: Berardi RR FS, Hume AL, Kroon LA, Newton GD, Popovich NG, Remington TL, Rollins CJ, Shimp LA, Tietze KJ, ed. Handbook of Nonprescription Drugs: An Interactive Approach to Self Care. 16th ed. Washington DC: American Pharmacists Association; 2009:203-212.
25. World Health Organization. The Treatment of Diarrhoea : A manual for physicians and other senior health workers. 2005; http://apps.who.int/iris/bitstream/handle/10665/43209/9241593180.pdf;jsessionid=4B4D653604F2804DDC1D6F001A333E13?sequence=1 (accessed Jan 4, 2019).
26. Berg BL, Lune H. Qualitative research methods for the social sciences. Boston: Pearson; 2012.
27. Kondracki NL, Wellman NS, Amundson DR. Content analysis: review of the methods and their application in nutrition education. J Nutr Educ Behav 2002;34(4):224-230. https://doi.org/10.1016/S1499-4046(06)60097-3

28. Elo S, Kyngas H. The qualitative content analysis process. J Adv Nurs. 2008;62(1):107-115. https://doi.org/10.1111/j.1365-2648.2007.04569.x
29. Berardi RR, Ferreri SP, Hume AL, et al. Handbook of nonprescription drugs: An interactive approach to self care. 16th ed. Washington DC: American Pharmacists Association; 2009.
30. Altman DG. Practical statistics for medical research. 1st ed. London: Chapman and Hall; 1991.
31. Dicpinigaitis PV. Angiotensin-converting enzyme inhibitor-induced cough : ACCP evidence-based clinical practice guidelines. Chest. 2006;129(1 Suppl):169S-173S. https://doi.org/10.1378/chest.129.1_suppl.169S
32. Sebastian JL, McKinney WP, Kaufman J, Young MJ. Angiotensin-Converting Enzyme Inhibitors and cough: prevalence in an outpatient medical clinic population. Chest. 1991;99(1):36-39. https://doi.org/10.1378/chest.99.1.36
33. Kosamu T, Mwanza K, Mbayo E, Gondwe K, Besa C. An unrecognised adverse drug reaction of enalapril led to suspicion of pulmonary tuberculosis infection. Med J Zambia. 2012;31(2):71-72.
34. Vegter S, de Jong-van den Berg LTW. Misdiagnosis and mistreatment of a common side-effect – angiotensinconverting enzyme inhibitor-induced cough. Br J Clin Pharmacol. 2010;69(2):200-203. https://doi.org/10.1111/j.1365-2125.2009.03571.x
35. Vegter S, de Boer P, van Dijk KW, Visser S, de Jong-van den Berg LT. The effects of antitussive treatment of ACE inhibitor-induced cough on therapy compliance: a prescription sequence symmetry analysis. Drug Saf. 2013;36(6):435-439. https://doi.org/10.1007/s40264-013-0024-z
36. Lombardi C, Crivellaro M, Dama A, Senna G, Gargioni S, Passalacqua G. Are physicians aware of the side effects of angiotensin-converting enzyme inhibitor?: a questionnaire survey in different medical categories. Chest. 2005;128(2):976-979. https://doi.org/10.1378/chest.128.2.976
37. Saengcharoen W, Lerkiatbundit S. Practice and attitudes regarding the management of childhood diarrhoea among pharmacies in Thailand. Int J Pharm Pract. 2010;18(6):323-331. https://doi.org/10.1111/j.2042-7174.2010.00066.x
38. Ross-Degnan D, Soumerai SB, Goel PK, Bates J, Makhulo J, Dondi N, Sutoto, Adi D, Ferraz-Tabor L, Hogan R. The impact of face to face educational outreach on diarrhoea treatment in pharmacies. Health Policy Plan. 1996;11(3):308-318. https://doi.org/10.1093/heapol/11.3.308
39. Zamora Gutiérrez AD, Aguilar Liendo AM, Cordero Valdivia D. Attitudes of Bolivian pharmacists in dealing with diarrhea cases. Bull Pan Am Health Organ. 1995;29(4):322-327.
40. Wachter DA, Joshi MP, Rimal B. Antibiotic dispensing by drug retailers in Kathmandu, Nepal. Trop Med Int Health. 1999;4(11):782-788. https://doi.org/10.1046/j.1365-3156.1999.00476.x
41. Duong DV, Le TV, Binns CW. Diarrhoea management by pharmacy staff in retail pharmacies in Hanoi, Vietnam. Int J Pharm Pract. 1997;5(2):97-100. https://doi.org/10.1111/j.2042-7174.1997.tb00892.x
42. Aktekin M, Erozgen C, Donmez L. Pharmacy approach to a case of acute diarrhoea with dehydration in Antalya, Turkey. Public Health. 1998;112(5):323-326. https://doi.org/10.1038/sj.ph.1900478
43. Ogbo PU, Aina BA, Aderemi-Williams RI. Management of acute diarrhea in children by community pharmacists in Lagos, Nigeria. Pharm Pract (Granada). 2014;12(1):376. https://doi.org/10.4321/s1886-36552014000100002
44. Smith RD, Coast J. Antimicrobial resistance: a global response. Bull World Health Organ. 2002;80(2):126-133.
45. Chalker J, Chuc NT, Falkenberg T, Do NT, Tomson G. STD management by private pharmacies in Hanoi: practice and knowledge of drug sellers. Sex Transm Infect. 2000;76(4):299-302. https://doi.org/10.1136/sti.76.4.299
46. Larsson M, Binh NT, Tomson G, Chuc NT, Falkenberg T. Private pharmacy staff in Hanoi dispensing steroids-theory and practice. Pharm Pract (Granada). 2006;4(2):60-67.
47. Chuc NTK, Larsson M, Falkenberg T, Do NT, Binh NT, Tomson GB. Management of childhood acute respiratory infections at private pharmacies in Vietnam. Ann Pharmacother. 2001;35(10):1283-1288. https://doi.org/10.1345/aph.10313
48. Kementrian Kesehatan Republik Indonesia. Petunjuk Teknik Pelaksanaan Standar Pelayanan Kefarmasian di Apotek. KEPMENKES 1027/MENKES/SK/2004. In. Jakarta: Kementrian Kesehatan Republik Indonesia; 2008.
49. Ambwani S, Mathur AK. Rational drug use. Health Administrator 2006;19(1):5-7.
50. Davidow LW. Self-care and nonprescription pharmacotherapy In: Berardi RR FS, Hume AL, Kroon La, Newton GD, Popovich NG, Remington TL, Rollins CJ, Shimp LA, Tietze KJ, ed. Handbook of nonprescription drugs: An interactive approach to self care. 16th ed. Washington DC: American Pharmacists Association; 2009:13-14.
51. Hornsby LB, Whitley HP, Hester EK, Thompson M, Donaldson A. Survey of patient knowledge related to Acetaminophen recognition, dosing, and toxicity. J Am Pharm Assoc (2003). 2010;50(4):485-489. https://doi.org/10.1331/JAPhA.2010.08175
52. Cham E, Hall L, Ernst AA, Weiss SJ. Awareness and use of over-the-counter pain medications: A survey of emergency department patients. South Med J. 2002;95(5):529-535.
53. Jayasutha J, Saipavan, Roshini KV. Assessment of impact of patient counseling on knowledge, attitude and practices in asthma patients. Global J Pharmacol. 2014;8(4):486-489. https://doi.org/10.5829/idosi.gjp.2014.8.4.84156
54. Ponnusankar S, Surulivelrajan M, Anandamoorthy N, Suresh B. Assessment of impact of medication counseling on patients' medication knowledge and compliance in an outpatient clinic in South India. Patient Educ Couns. 2004;54(1):55-60. https://doi.org/10.1016/S0738-3991(03)00193-9
55. Alkatheri AM, Albekairy AM. Does the patients' educational level and previous counseling affect their medication knowledge? Ann Thorac Med. 2013;8(2):105-108. https://doi.org/10.4103/1817-1737.109823
56. Schneider CR EA, Geelhoed E, Kendall PA, Murray K, Garnett P, Salama M, Clifford RM. Provision of primary care to patients with chronic cough in the community pharmacy setting. Ann Pharmacother. 2011;45(3):402-408. https://doi.org/10.1345/aph.1P514

57. Watson MC, Bond CM, Grimshaw JM, Johnston M. Factors predicting the guideline compliant supply (or nonsupply) of non-prescription medicines in the community pharmacy setting. Qual Saf Health Care. 2006;15(1):53-57. https://doi.org/10.1136/qshc.2005.014720
58. Zurmatias R. Pharmaceutical Services in Community Pharmacy in East Jakarta [Master Thesis]. Thailand, Chulalongkorn University; 2007.
59. Purwanti A, Harianto, Supardi S. [An overview of the implementation of pharmaceutical service standards in DKI Jakarta pharmacies in 2003].Majalah Ilmu Kefarmasian. 2004;1(2):102-115.
60. Kroeger A, Ochoa H, Arana B, Diaz A, Rizzo N, Flores W. Inadequate drug advice in the pharmacies of Guatemala and Mexico: the scale of the problem and explanatory factors. Ann Trop Med Parasitol. 2001;95(6):605-616. https://doi.org/10.1080/00034980120092543
61. Brata C, Fisher C, Marjadi B, Schneider CR, Clifford RM. Factors contributing to the provision of self-medication consultations in eastern Indonesian community pharmacies: a qualitative study. BMC Health Serv Res. 2016;16:179. https://doi.org/10.1186/s12913-016-1425-3
62. Thang DX. An investigation of non-prescription medicine supply in community pharmacies in Hanoi, Vietnam. Nottingham, University of Nottingham; 2013.
63. Perraudin C, Brion F, Bourdon O, Pelletier-Fleury N. The future of pharmaceutical care in France: a survey of final-year pharmacy students' opinion. BMC Clin Pharmacol. 2011;11:6. https://doi.org/10.1186/1472-6904-11-6
64. Shearer B, Ng S, Dunford D, Kuo IF. Training needs of Mannitoba pharmacists to increase application of assessment and prescribing for minor ailments into practice: a qualitative and quantitative survey. Pharmacy (Basel). 2018;6(3):82.
65. Goel P, Ross-Degnan D, Berman P, Soumerai S. Retail pharmacies in developing countries: a behavior and intervention framework. Soc Sci Med. 1996;42(8):1155-1161. https://doi.org/10.1016/0277-9536(95)00388-6
66. Ross-Degnan D, Laing R, Santoso B, Ofori-Adjei D, Lamoureux C, Hogerzeil H. Improving pharmaceutical use in primary care in developing countries: A critical review of experience and lack of experience. Paper presented at: International conference on improving use of medicines.1997; Chiang Mai, Thailand.
67. Marjadi B. Challenges in developing infection control programmes for Indonesia. Aust Infect Control 2001;6(1):22-25. https://doi.org/10.1071/HI01022
68. Smith F. Community pharmacy in Ghana: enhancing the contribution to primary health care. Health Policy Plan. 2004;19(4):234-241. https://doi.org/10.1093/heapol/czh028
69. Departemen Kesehatan Republik Indonesia. [Health worker pocket book: Cross Diarrhea]. Jakarta: Departemen Kesehatan RI; 2011.
70. Simasek M, Blandino DA. Treatment of the Common Cold. Am Fam Physician. 2007;75(4):515-520.
71. Covington TR, Henkin R, Miller S, Sassetti M, Wright W. Treating the common cold : An expert panel consensus recommendation for primary care clinicians. Am J Nurse Pract. 2004;8(11):77-88.

Ayadurai S, Sunderland B, Tee LB, Hattingh HL. A training program incorporating a diabetes tool to facilitate delivery of quality diabetes care by community pharmacists in Malaysia and Australia. Pharmacy Practice 2019 Apr-Jun;17(2):1457.
https://doi.org/10.18549/PharmPract.2019.2.1457

Original Research

A training program incorporating a diabetes tool to facilitate delivery of quality diabetes care by community pharmacists in Malaysia and Australia

Shamala AYADURAI, Bruce SUNDERLAND, Lisa B. TEE, H. Laetitia HATTINGH.
Received (first version): 26-Jan-2019 Accepted: 2-Jun-2019 Published online: 14-Jun-2019

Abstract

Objectives: To assess a clinical training program on management of Type 2 Diabetes Mellitus (T2DM) incorporating a diabetes tool, the Simpler™ tool. Subsequently pharmacists' experience utilising the tool to deliver structured, consistent, evidence-based T2DM care was explored.

Methods: Full-time non-credentialed diabetes pharmacists providing diabetes medication management services in community settings were purposively recruited. Participants had either face-to-face or online training on diabetes management using the tool which took about two hours and 20 minutes to complete. Their diabetes management knowledge was assessed pre- and post-training using quantitative methodology. They were then required to apply the tool in daily practice for one month. Feedback on both the training sessions and tool utilisation were obtained through semi-structured interviews and analysed using a qualitative approach.

Results: Twelve pharmacists participated: Six from Australia and six from Malaysia. Before attending the training session, their median test score was 6.5/27, IQR 1.4 (1st marker) and 5.3/27, IQR 2.0 (2nd marker). After training, the scores doubled to 14.3/27, IQR 4.5 (1st marker) and 11.3/27, IQR 3.1 (2nd marker), showing significant improvements (p=0.002). Interview data identified perceived effectiveness factor through use of the tool. Participants found the content relevant, structured, concise and easy to understand; enabled comprehensive medication reviews; focused on achieving glycaemic improvement; facilitated documentation processes and pharmacists' role in T2DM management; and as a specific aid for diabetes management. Barriers included lack of accessibility to patients' laboratory data in Australia.

Conclusions: The targeted training improved pharmacists' knowledge on diabetes management and supported the Simpler™ tool use in practice as a structured and beneficial method to deliver evidence-based T2DM care.

Keywords

Education, Pharmacy, Continuing; Diabetes Mellitus, Type 2; Blood Glucose; Documentation; Pharmacists; Pharmaceutical Services; Evaluation Studies as Topic; Malaysia; Australia

INTRODUCTION

Health professionals are required to be knowledgeable about the need for appropriate glycaemic control and measures to prevent long-term diabetes complications. Diabetes caused 1.6 million deaths worldwide in 2016 which was an increase from 1 million in 2000.[1]

Type 2 diabetes mellitus (T2DM) guidelines cover seven evidence-based factors to be addressed in the management of patients to reduce diabetes related problems.[2-5] Those are glycaemia, cholesterol and blood pressure control, medication, lifestyle, cardiovascular disease risk management and patient education. Despite the evidence, the incidence of complications remains high, both in Malaysia and Australia.[6] One reason may be a lack of a structured approach focused on addressing these seven factors in diabetes intervention studies. While some studies showed an intervention improved patients' glycated haemoglobin (HbA1c) values, others showed no significant changes.[7-12] Pharmacists' contribution to optimise medication therapy have been widely documented.[13] Yet, pharmacists express the need for further training to upskill their competence in managing chronic conditions.[14] To address these issues, a pharmacist diabetes intervention tool, the Simpler™ tool, was developed to facilitate the delivery of structured, evidence-based quality care. To date, there is a lack of diabetes intervention studies which address the seven factors covered in the guidelines. This provided an opportunity to develop a tool that facilitated the provision of structured targeted diabetes care of consistent quality. The tool consists of seven diabetes factors and 32 corresponding evidence-based indicators according to diabetes practice guidelines. The indicators were originally sourced from diabetes practice guidelines from Australia, Malaysia the United Kingdom (UK) and the United States of America (USA).[2-5] The Simpler™ tool serves as a structured aide memoir for pharmacists. The tool aims to prompt pharmacists to address all seven diabetes factors and its indicators. While Australia's and Malaysia's healthcare systems may differ, the diabetes practice guidelines and existing pharmacist led diabetes medication management service (MMS) are similar. The Simpler™ training was developed to standardise the application of the tool in provision of MMS services such as Diabetes MedsCheck in Australia and Diabetes Medication Therapy Adherence

Shamala AYADURAI. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia). shamala.ayadurai@postgrad.curtin.edu.au
Bruce SUNDERLAND. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia). B.Sunderland@curtin.edu.au
Lisa B G TEE. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia). L.Tee@curtin.edu.au
H. Laetitia HATTINGH. School of Pharmacy and Pharmacology, Griffith University. Gold Coast, QLD (Australia). L.Hattingh@griffith.edu.au

Clinic in Malaysia. The development of the Simpler™ tool was facilitated by a Delphi process and was validated between September and December 2014 and described in a previous study.[15] The aim of this study was to evaluate a training program for non-diabetes credentialed pharmacists on management of T2DM using the Simpler™ tool and subsequently explore their experiences of utilising the tool when providing MMS.

METHODS

This study involved the development and assessment of a training program that incorporated the use of the Simpler™ tool. Pharmacists' knowledge was assessed pre- and post-training through a questionnaire. The same pharmacists subsequently applied the tool in practice for one month and their experiences were obtained through semi-structured interviews. Their perception of the training program and the utilisation in practice was assessed using a qualitative approach. This pilot study was conducted as part of a larger project and preceded a randomised controlled study.[16] This study received ethics approvals from the Curtin University Human Research Ethics Committee (RDHS-06-14), Western Australia and the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia.

Participant recruitment

Pharmacists targeted were community pharmacists involved in the provision of diabetes care to patients, in full-time employment but non-diabetes credentialed pharmacists. The literature on sample size determinants for a qualitative study suggested a sample size between five and 25.[17,18] Taking this factor into consideration and pharmacists' potential time constraints, 13 potential participants were approached through personal contacts of the researchers and a snowball recruitment process.[19,20] They were invited by email and were provided with an information sheet about the research and had the opportunity to ask questions before providing consent.

Quantitative assessment of the training program

Participants were required to complete a training session. The overall goal of the training was to enhance participants' understanding of the pharmacist's role in providing diabetes care and incorporated demonstrating how the Simpler™ tool facilitated the provision of structured diabetes care. Emphasis was placed on how the tool assisted in identifying the reasons for therapeutic failure and resolve the issues by providing evidence-based suggestions through application of a systematic approach. The training program was developed by the primary author (SA) and the overall syllabus details are presented in Table 1.

Pre- and post-evaluation questions (in the format of questionnaires) and training modules were peer-reviewed by three pharmacist academics with specialist diabetes knowledge. The face, content and usefulness were subsequently validated, and pilot tested by two Australian and two Malaysian pharmacists experienced in the management of diabetes patients who provided further feedback. Adjustments to the modules were subsequently made. Some pharmacists had a face-to-face workshop while others received online training. Since the first author was in Australia at the time of the study, face-to-face training sessions for the Australian participants were offered in the first instance, followed by e-learning sessions for the Malaysian participants. The same presentation slides were used for both the face-to-face and the online training sessions. In addition, the voice-over of the presentation slides followed a standardised script. The recorded training modules were uploaded to a cloud file storage service which allowed large file viewing. Sharing and access to the file was provided to participants via email. Pharmacists had the opportunity to ask questions during face-to-face workshops and those doing the online training through various channels including social media.

Table 1. The Simpler™ training program content and goals

Module no.	Module title	Module content	Module goals
1.	Introduction	1. Describe the pharmacist's role in management of T2DM 2. Explain the research objectives and significance 3. Outline the research plan and present findings from the Simpler™ tool development and validation phase	To provide an overview and understanding of pharmacists' role in diabetes management.
2.	Simpler™ tool validation	1. Outline and describe the seven indicators incorporated into the Simpler™ tool 2. Explain the benefits of the Simpler™ tool using evidence-based information	To help pharmacists understand the Simpler™ tool development and evaluation process to increase confidence in its usage
3.	Case study discussion	1. Outline the information gathering process 2. Practise effective interventions using the Simpler™ tool	To analyse the causes of therapeutic failure in case study examples. To demonstrate and apply the Simpler™ tool to solve the issues. To justify each suggestion with evidence-based information using the Simpler™ tool
4.	Writing intervention notes	Writing case notes/*Guild Care using the Simpler™ tool	To compose patient notes using a systematic approach for writing

*Guild Care refers to the software used by some Australian community pharmacists to record and report patient information [http://www.guildlink.com.au/guildcare/about-us/]. T2DM= Type 2 diabetes mellitus

Upon completion, participants attending the face-to-face training completed the post-training questionnaire while participants who followed the online training informed the researcher (SA) and were subsequently sent the post-training questionnaire by email. Both groups had access to notes and the Simpler™ tool when completing the post-training questionnaire.

The pre-training questionnaire consisted of two sections: Section A included five closed-ended questions directed at participants' training background and current practices, and Section B consisted of two open-ended questions on a patient's case scenario aimed to test participants' knowledge of diabetes guidelines and their skills in suggesting medication management interventions. The post-training questionnaire contained the same questions in Section B of the pre-training questionnaire. The pre-and post-training questionnaire is shown in Online Appendix. The questionnaire was face and content validated by the same pharmacists who pilot tested the training modules. Participants' answers were marked by two markers using a written marking scheme validated by an independent pharmacist. Each answer had point/s awarded and the scores were marked out of 27.

Qualitative assessment of the training program and tool utilisation in practice

Upon completion of the training, the same participants were given one month to apply the tool in their practice settings. They were provided with a template to record the number of times the tool was used on patients and the types of interventions conducted by utilising the tool. A unique identification number was allocated indicating where the participant originated: participants were assigned the letter P and numbered 1 to 6. The letter A was assigned to participants from Australia (example P1A) and those from Malaysia the letter M (example P1M). This allowed to differentiate participants' perception of the tool from both countries as the two healthcare systems differed.

Semi-structured interviews were conducted by SA (July to August 2015). Face-to-face interviews were conducted with two pharmacists at their workplaces and two at a university. Telephone interviews were conducted with the remaining eight pharmacists. The interview process followed Kvale's seven stages for conducting interviews and the requirements of consolidated criteria for reporting qualitative research guidelines (COREQ).[21,22] The interview guide consisted of three sections, sections A, B and C, presented in Table 2. The interviewer followed the interview guide while allowing opportunity for probing questions and clarifications. The interview guide was pilot tested with two independent pharmacists.

Participants could raise points during the interview that

Table 2. Interview Questions Used to Guide the Interview Process

Section A: Details and experience of pharmacist	
1.	What is your age?
2.	Were you trained to practise Diabetes MedsCheck/ medication therapy adherence clinic (MTAC) diabetes?
3.	If yes, how did you undertake this training?
4.	Do you have any post-graduate qualifications? If yes, what qualifications?
5.	On average, how many hours do you work per week in the community setting?
6.	How many years have you been practising as a pharmacist in the community?
7.	In which year did you first obtain your registration to practise as a pharmacist?
8.	How would you consider your current role in the pharmacy? Prompt: Dispensary pharmacist, patient care-focused, managerial role, MTAC diabetes/Diabetes MedsCheck pharmacist, clinical pharmacist….
Section B: Previous and current experience in providing diabetes medication management service (MTAC diabetes, Diabetes MedsCheck)	
1.	On average, how many patients do you provide the service to in a day/week/month?
2.	How do you normally review patients? Prompt: use MTAC diabetes/Diabetes MedsCheck checklist, own checklist, tools from the web, etc
3.	How often do you refer to the Australian/Malaysian guidelines on diabetes?
Section C: Experience in using Simpler™ tool	
1.	Please comment on your experience in using the Simpler™ tool. Prompts: a. Relevance when reviewing patient? b. Ease of Use? Content simple to understand? c. Relevance to local practice and guidelines? d. Managing consultation time with patients? e. Intervention format? f. Ease of remembering? g. Guide pharmacists to make interventions? h. Record intervention notes in a consistent, structured manner? i. Clarity of tool? j. Providing evidence-based information to physician, patients?
2.	On how many patients did you use the Simpler™ tool?
3.	Talk about the interventions you made using the Simpler™ tool.
4.	Are the medication reviews with patients with diabetes different now compared to when you were not using the Simpler™ tool? If yes in what way?
5.	How was the Simpler™ training session? Prompt: suggestions for improvement
6.	Would you recommend the Simpler™ tool to other community pharmacists?
7.	Are there any recommendations you like to make to enhance the usability of the tool?
8.	Thank you again for your time. Before we finish, do you have any comments you'd like to make, about the research topic or training or about the interview?

Table 3. Participant demographic and practice information (N=12)

	Mean (SD)			Median (IQR)			Min	Max
	A	M	Total	A	M	Total		
Age (years)	30.7(8.6)	29.8(5.1)	30.3(6.8)	27(8)	28(9.8)	27 (7.8)	25	48
Working hours/week	42.5(3.0)	38.5(0)	40.5(2.9)	43.5(5.5)	38.5(5.8)	38.5(5.8)	38	45
Years practising as pharmacist	7.3(9.7)	4.2(3.4)	5.7(7.1)	3.6(8)	2(6)	2.6 (5)	2	27
Average patients provided service to during research period	3(2)	10(5.5)	7(5.4)	2(4)	10(7)	6(8)	1	20

A=Australia, M=Malaysia, Min=Minimum, Max=Maximum, IQR=Interquartile Range, SD=standard deviation

were not included in the interview guide if these were relevant to the overall aim of the study. The interviews ended when all questions were exhausted and no new information was obtained (interviews reached a saturation point).[23] Interviews were audio recorded and transcribed verbatim by SA. Audio recordings were saved with a unique identification code to protect participants' anonymity. A project supervisor (HLH) conducted quality checks of transcripts against audio recordings.

Data analysis

Differences between the pre- and post-training questionnaire responses were analysed using the Wilcoxon Signed Rank Test for non-parametric testing as the sample did not meet the requirements for normal distribution. SPSS statistical package version 22 was used for the quantitative analysis.[24]

Descriptive analyses were used for closed-ended interview questions (Sections A and B of the interview guide) whilst thematic analysis was used for the open-ended questions (Section C) to gain insight into pharmacists' opinions, views and perceptions of the Simpler™ tool. In addition, the open-ended questions were used as a guide to identify emerging patterns. An inductive process was followed throughout the analysis and recurring topics from the interview data were investigated using the qualitative framework method as suggested by Boyatzis.[25] Participants' raw data were highlighted in order to determine sentences or keywords which were then assigned a label called 'codes'. The codes were then sorted into topics. Different views under the same topic were grouped as a subtopic. Transcripts were then scrutinised again for new or emerging topics. The coding process was performed by SA and project team members verified the analytical process before finalising the analysis. NVivo qualitative analysis software version 10 was used to categorise and organise the qualitative data.[26]

RESULTS

Participant characteristics

Of the 13 pharmacists approached, 12 consented to undertake the study. There was equal representation of participants from Malaysia (n=6) and Australia (n=6). Most participants (75%, 9/12) had less than three years' experience of conducting diabetes management. Table 3 presents participants' demographic data and practice experiences.

Interestingly, the majority of participants (66.7%; 8/12) had never or only sometimes referred to the Australian or Malaysian diabetes practice guidelines when providing diabetes MMS.[2,3,27] Regarding the question "What motivated you to participate in this research?" most participants ranked interest in the subject (83.3%;10/12) and improve patients' outcomes (91.7%; 11/12) as the main incentive.

Quantitative assessment of training program

1) Pre- and post-training questionnaire

There was a significant improvement in post-training questionnaire scores (P=0.002) by both markers. Before attending the training session, the participants' median test score was 6.5/27, interquartile range (IQR) 1.4 (1st marker) and 5.3/27, IQR 2.0 (2nd marker). After attending the training session, the scores doubled to 14.3/27, IQR 4.5 (1st marker) and 11.3/27, IQR 3.1 (2nd marker), showing significant improvements (p=0.002). Pharmacists initially struggled to frame better questions to make meaningful interventions. However, post-training results showed a marked improvement in addressing the seven diabetes factors to facilitate the intervention process.

Qualitative assessment of the training program and tool utilisation in practice

All 12 pharmacists participated in the semi-structured interviews. The average duration of the interviews was 32 minutes with the face-to-face interviews ranging between 19 to 32 minutes (mean 26 minutes) and the telephone interviews between 16 to 54 minutes (mean 36 minutes). Most participants (91.7%; 11/12) used the Simpler™ tool to facilitate their intervention process. Those included: to add a statin to achieve cholesterol targets; initiate metformin in patients with uncontrolled diabetes; dose adjustments and improving medication adherence. One participant did not use the tool as this participant only focused on lifestyle factors during patient consultations. The participant therefore expected more detailed counselling points on lifestyle management. Participants reported making interventions using one or more tool indicators. The types and number of interventions made are provided in Table 4 with supporting quotations.

Interview analysis revealed patterns that were grouped into three main topics. Those were:

- Perception of training program (interview guide question 5 of Section C),
- Perceived effectiveness of the Simpler™ tool (from various questions), and
- Barriers to the Simpler™ tool utilisation (interview guide questions 1,3,4,6 of Section C).

1) Perception of the training program

Table 4. Types and number of interventions made by pharmacists using the Simpler™ tool

Corresponding letter of Simpler™ tool	Number of total interventions	Type of Interventions	Supporting quotes
S (Statin/Cholesterol control)	4	Initiate statin	So basically with [the] first patient, he was not on [a] statin, with Simpler™ that's the first thing I spoke to him about, because he is at high risk (P7A)
I (Insulin/glycaemic control)	7	Suggestion to initiate metformin	My first patient was not on metformin even though [it] is not contraindicated. (P6M)
		Initiate insulin	Patients with HbA1c constantly above 7%, I gave suggestions to start insulin. (P1M)
M (Medication management)	10	Patient's compliance	Yes, it was simply compliance because he was not seeing that this medication is necessary for him and that includes his diabetes medication (P3A)
		Medication related problems identified	Because blood sugar is not controlled, [the] doctor increased [the] metformin dosage from 1g to 2g but the script is for just immediate-release metformin 1g, 2 tablets at night which is the wrong dose because immediate-release dosing should be 1 tablet twice daily (P5A) I managed to do a quick medication review and found that his lipid dose, fenofibrate, was too high for a patient with creatinine clearance of 45 and I suggested [to the] doctor to change it to 96mg daily rather than 145mg daily. (P5A)
L (Lifestyle management)	8	Diet, foot care, body mass index	... I did a lot was lifestyle, when we talked about lifestyle she had hypoglycaemia so we talked about hypoglycaemia. This other patient has her BMI as 29 so we talked about BMI. She is quite eager so we talked about plate model. (P2A) His diabetes levels weren't well controlled and when we went through Simpler™, I realised his diet wasn't very healthy. So, I went through the diet and he also mentioned that he doesn't check his feet regularly as well because with diabetes you need to get your foot checked regularly so I advised him the importance of checking his foot regularly. (P4A)
R (CVD risk reduction strategies)	3	Suggestion to initiate aspirin based on Framingham risk score	Based on that, the patient fit the criteria to start aspirin, therefore I advised the patient and recorded the intervention (P1M)

Most participants (83.3%; 10/12) commented that the training module content was adequate and relevant. In addition, they found the length of training appropriate. The majority believed the Simpler™ training session increased their knowledge and confidence in evidence-based diabetes management and for some it served as a refresher. Participants provided positive comments on the training sessions overall. The supporting participants' quotations on the training session are presented in Table 5.

Improvements to the Simpler™ training modules included to: 1) add an intervention recording template to document interventions in patients' medical records (PMR), 2) develop a flow chart to illustrate the information gathering process before the Simpler™ tool application, 3) include more slides on identifying medication related problems, 4) add information on glucagon use, and 5) add materials on lifestyle management.

2) Perceived effectiveness of the Simpler™ tool in practice

All 12 participants found the Simpler™ tool to be beneficial when conducting medication reviews with patients. Participants used words such as 'organised', 'sequential', 'straight to the point', 'my accounting made relevant', 'compact', 'complete' and 'easiest tool' to describe the benefits. Participants from both Malaysia and Australia expressed their reliance on the Simpler™ tool when conducting MMS as they considered it to be a point of reference. All participants expressed the tool as an 'aide memoir' in recollection of the factors associated with diabetes management.

Eight specific issues were identified on the perceived effectiveness of the tool, summarised with corresponding quotations in Table 5. The Simpler™ tool allowed participants to conduct more comprehensive reviews during consultations. Of specific interest was that one participant found that the tool made diabetes medication reviews more purposeful as improving patients' glycaemia levels became the focus. However, three of the participants found the tool time consuming to use. However, they indicated that the benefits of being able to conduct detailed and organised patient assessments outweighed the time factor. A common view amongst participants was that the tool facilitated the writing of interventions in PMR (Malaysia) and in software programs (Australia). In addition, one participant felt the tool promoted her to have a more specialised role in diabetes management and thus found the tool specifically targeted for diabetes management.

3) Perceived barriers

Two specific issues were identified on the perceived barriers to the effective use of the tool, as summarised in Table 5. Two Australian participants found the limited access to patient's medical data a barrier and was therefore unable to make a meaningful intervention while one

Table 5. Perception of training and perceived effectiveness and barriers of Simpler™ tool application with quotations	
Topic: Perception of the training program	
Subtopic	Supporting quotations
Increased knowledge on evidence-based diabetes management	*In my practice, I learn something new because previously I did not write any intervention, I mean I just counselled the patient based on their medication but now I am comfortable to make an intervention. (P1M)*
Increased confidence to provide diabetes care	*You know what's good, the example you gave us in the Simpler™ training of the little lecture that you sent to the doctor about the patients that is helpful. But I haven't sent anything to the doctor, but I still have the confidence to send the doctor something like that. (P7A)*
Useful as a refresher	*"It reminded me, I mean like a revision. The Framingham score for example, I forgot about that." (P6M)*
Topic: Perceived effectiveness of the Simpler™ tool	
Subtopic	Supporting quotations
Content relevant, structured, concise and easy to understand	*Well I think that diabetes is so overwhelming, you just don't know where to start, how to begin so having a structured approach is very beneficial. (P6A)* *I think this is straight to the point. The existing guide for pharmacists, can be irrelevant and quite time consuming for us to go through. (P5A)* *Simpler™ tool is a compact tool and one of the easiest. In one word, you can summarize everything. (P1M)*
Point of reference	*Yes, because all the indicators in the tool are proven from local guidelines and Australian guidelines so no one will dispute the contents. (P2M)* *So far, I rely heavily on the tool because it has all the targets and it is based on Australian guidelines. (P2A)*
Reminder of factors associated with diabetes management (aide memoir)	*Patients deviate, I come back I might have missed the blood pressure component but with the tool, when they deviate, I need to go through the checklist, all these points, so it's a good thing. (P3A)*
Able to conduct comprehensive medication review	*I go a bit thorough and ask more questions according to the tool and find out a little more and counsel and educate patients a little bit more. So, usually when I'm doing my diabetes MedsCheck, I run through what's on the existing software program but then it's not enough so the Simpler™ tool pushes [me] to do a bit more. (P7A)* *Initially when we first applied it, since I was not familiar, it was more time consuming. The whole session took me about an hour for the first patient. (P5A)* *I need to go through all these checklists, all these points, so it's a good thing, it's longer but in a good way… (P3A).*
Focus on glycaemic improvement	*Before this we only focussed on the education part, now the interesting part is the aim to reduce HbA1c. (P4M)*
Facilitate documentation of interventions	*Because I'm using Simpler™, I wrote clearly inside the patients' book, the doctor complimented that it was good and well written. They salute the pharmacy, but before this I only used simple words and my notes were incomplete. (P4M)*
Facilitated pharmacist role in diabetes management	*Really good thing and I think if a pharmacist can set themselves up to be a specialist in diabetes management through using the Simpler™ tool reporting back to the GP with six monthly progress. (P6A)*
Specific aid for diabetes management	*That one you have to print from the Guild Care program [software to support provision of professional services] itself. Yes…You have to click, you just register your patients and you just print it out. It doesn't ask anything…all it asks is, does this patient have T2DM? And then classifies as diabetes MedsCheck so it doesn't have what Simpler™ has, specifically for patients with diabetes. (P3A)*
Topic: Barriers to effective use of the Simpler™ tool	
Subtopic	Supporting quotations
Unable to make intervention unless a Home Medicine Review (HMR) pharmacist	*It's fine but the only thing from the Simpler™ tool I found that it would be much more applicable for an HMR pharmacist as opposed to a regular pharmacist in a pharmacy unless that pharmacist has been specifically trained in or even a diabetes educator.* (P3A)
Difficult to access laboratory results (Australia)	*The only thing with diabetes MedsCheck and using the tool is that I can't have access to their blood HbA1C results and I even tried to get it from the surgery. (P2A)* *It was just at one point there was not enough laboratory test results. In fact, when I did medication review using Simpler™, I could only say" 'Yes that there is statin' but I do not know what the statin level was and what the cholesterol level was. (P3A)*

believed accredited pharmacists providing home medicine reviews service were better suited to make interventions.

Participants provided the following suggestions to further refine the Simpler™ tool:

- Use visual prompts
- Larger font for headings
- Use either Malaysian or Australian targets
- Use terms like Asian or Caucasian for body mass index targets

Based on these suggestions, the tool was further refined as presented in Table 6.

DISCUSSION

Table 6. The refined Simpler™ pharmacist diabetes intervention tool	
S=Statin	• Statin initiation in patients with CVD • [a]Achieve targets for LDL and TG • Statin initiation in patients > 40 years old without CVD
I=Insulin/Glycaemic control	• Insulin initiation if glycaemic control not achieved despite being on two or more oral hypoglycaemic agents • Target of HbA1c ≤ 7% if no other complications • Management of hypoglycaemia • [b]Self-monitoring of blood glucose • Aim a reduction of HbA1c by 1% if above target HbA1c • Initiate/continue metformin if not contraindicated
M=Medication	• Assess medicine related problems • Review medication adherence
P=Blood Pressure	• [c]Achieve BP target • ACEI/ARB initiation in patients with/without microalbuminuria /proteinuria • Reduce sodium intake (<2400mg sodium/day; 6g/1 teaspoon/day) • One or more antihypertensive medicine to be taken at bedtime
L=Lifestyle	• Exercise: 30 mins walking (or equivalent) 5 or more days/week (total ≥150 min/week) • Weight loss: Caucasian (BMI< 25 kg/m^2), Asian (BMI ≤ 23 kg/m2) • Smoking cessation • Waist circumference: Caucasian (<94 cm in men, <80 cm in women, Asian (≤90 cm in men, ≤80cm in women) • Alcohol intake: ≤2 standard drinks (20 g) per day for men • Management of stress & diabetes related distress • Erectile dysfunction: recommend Phosphodiesterase-5 inhibitor as first line therapy for male patients • Foot care • Diet advice using plate model • Annual eye assessment • Address sleep hygiene
E=Education	• Knowledge & understanding of medicine • Medicine storage • Medication optimisation during fasting month for Muslims and other religious groups
R=Cardiovascular Risk	• Aspirin therapy as secondary prevention in those with diabetes with history of CVD • Use of Framingham risk calculator to calculate CVD risk and educate patients • [d]Aspirin therapy (75mg-162mg/day) as primary prevention to decrease CVD risk (10 year risk>10%, Framingham)
[a]Australia: Low density lipoprotein(LDL) <2.0 mmol/L, Triglyceride (TG) <2.0 mmol/L, Malaysia: LDL <2.6 mmol/L, TG <1.7 mmol/L [b]Australia: (6.0-8.0 mmol/L fasting),(8.0-10.0 mmol/L-2h postprandial); Malaysia:(4.4-7.0 mmol/L fasting),(4.4-8.5 mmol/L-2h postprandial) [c]Australia:≤140/90 mmHg, with albuminuria/proteinuria<130/80 mmHg; Malaysia: ≤135/75 mmHg [d]Recommendations according to 2016 ADA Standards of medical care in diabetes[5]; Malaysia Clinical Practice Guidelines recommend aspirin therapy if 10 year risk>10% only for patients aged 65 years and above[2] ACEI=Angiotensin converting enzyme inhibitors; ARB= Angiotensin 11 receptor blockers; BP= Blood pressure; BMI=Body mass index; CVD=Cardiovascular disease; HbA1c=glycosylated haemoglobin and reflects average glycaemia the preceding 6-8 weeks LDL=Low density lipoprotein; TG=Triglyceride	

This study employed qualitative methodology to identify underlying topics related to the use and effectiveness of the Simpler™ tool in providing a structured process for monitoring T2DM patients in a community setting. Quantitative methodology was also used, and the pre-and post-training questionnaire evaluated the knowledge and skills of participants before and after the training sessions. Several studies have used a similar approach to evaluate the effectiveness of a training program.[28-31] Pharmacists from both countries found the Simpler™ tool comprehensive and useful in prompting them to deliver structured diabetes care and recommend clinical interventions. Similar benefits were reported in studies using a defined approach to aid decision making such as the intervention tool for prescribing antibiotics, asthma intervention tool for pharmacists, inappropriate medication use and prescribing indicators in the elderly Australian population and a dietary intervention tool.[32-36] Participants' evaluation of the effectiveness of the Simpler™ tool was similar to a hypothesis by Weed who suggested two important features in order for a tool to be effective: (1) the tool should enable information retrieval and organisation and (2) the tool should empower the user to use the information obtained and own judgement to make an intervention.[37] While the intention of the tool is to facilitate the intervention process, pharmacists are expected to have prior knowledge in guideline recommended treatment for diabetes.

The training content was reported to be relevant to practice and increased pharmacists' knowledge of guideline-based diabetes management. Similar to other studies where pharmacists perceived increased confidence after training, the Simpler™ training increased participants' confidence to deliver guideline adherent diabetes care in their practice settings. The average post-test marks (11.3 marks) in this study were lower than the full score (27 marks). The low scores may reflect participants' limited ability to detect clinical problems in the case study provided. The most likely cause hinges on the fact that the majority (75%) of participants had less than three years of managing patients with T2DM diabetes. In addition, participants were expected to have existing knowledge on practice guidelines to facilitate the intervention process. In this cohort, most pharmacists (66.7%) had never or only sometimes referred to the guidelines. This finding suggests that future training sessions should include diabetes practice guidelines as prerequisite reading material.

The content of the Simpler™ training module was informed by the results of a previous Australian pharmacists' diabetes pilot program during which pharmacists described the training being more theoretical than practical and requested more concise information.[38] Although this element guided the design of the Simpler™ training program some pharmacists identified a need to include more clinical information and lifestyle counselling points in the training content. To address this issue, additional materials were subsequently developed on pharmacotherapy management which summarised the thought process required to make pharmaceutical care interventions.[39] Similarly, two additional web links were added directing pharmacists to a list of counselling points on lifestyle management.[40,41]

Documenting pharmacists' interventions into patients' medical record has not traditionally been practised by community pharmacists but is more common among hospital pharmacists.[39] Despite this, participants who completed the training expressed their willingness and were confident to record their clinical interventions. Information from patients' medical data expedites pharmacists' assessment of pharmacotherapy issues and enable them to make quality interventions.[42] In this study, pharmacists from Australia who were unable to access it were less effective in making clinical interventions despite applying the Simpler™ tool. This finding suggests that while the Simpler™ tool helped to facilitate clinical interventions by pharmacists, access to patients' information, including laboratory data, is beneficial for its effective use and to make meaningful recommendations.

The aim of this pilot study is to explore pharmacist's perception of the Simpler™ tool and obtain suggestions for improvement. Thus, participants who are actively engaged in diabetes management service were purposively recruited using the snowball sampling. However, the risk of their views being biased towards a more positive response during the interview session is acknowledged, as was shown in other studies.[43] In addition, the small sample size from one state in Malaysia and one in Australia may not reflect the views of all pharmacists. The different presentation method of training, namely online and face-to-face workshops, may have influenced the pre-and post-training results. However identical content was delivered through both training approaches to minimise the differences. In addition, the evidence for effectiveness of the tool in practice settings was limited to pharmacists' self-reported data on the number of interventions conducted. Therefore, independent evaluation of patients' clinical outcomes is needed to ascertain the value of pharmacists' interventions. Although all participants demonstrated improved knowledge and skills assessed through pre- and post-training results, there is a lack of evidence of the longevity of knowledge, specifically in terms of reinforcement of the information and application of knowledge and skills. The Simpler™ tool on the other hand incorporated a hand-out which remained with the pharmacists and therefore encouraged continued use. The tool was found to be feasible among pharmacists in Australia and Malaysia as both countries had similar diabetes guidelines and pharmacists from both countries provided diabetes management service.[2,3,44,45] However, due to yearly updates on some guidelines, contents such as the therapeutic goals may have to be amended.

CONCLUSIONS

This was the first study to explore pharmacists' views on a structured diabetes intervention tool and training program to guide them in addressing each of the seven guideline required diabetes factors. The Simpler™ training program and tool proved to be a useful approach to upskill pharmacists and improve their confidence in delivering diabetes care. Pharmacists viewed the tool as relevant and beneficial in facilitating the provision of structured, evidence-based interventions in diabetes care.

ACKNOWLEDGEMENTS

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article. We would like to extend our gratitude to all 12 participants in this study and Ms. Li Yun Chong for her help in participant recruitment. We also thank Mr. Mustafa Atee, Ms.Oiyammal Chelliah, Ms. Chew Beng Ng and Dr.Tin Fei Sim for their invaluable comments on the training modules; pre-and post-training questionnaires.

CONFLICT OF INTEREST

All authors have no financial disclosures or conflicts.

FUNDING

None.

References

1. Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva: World Health Organization; 2018.
2. Ministry of Health; Malaysia. Clinical practice guidelines. management of type 2 diabetes mellitus (5th Edition)2015: Available at: http://www.moh.gov.my/penerbitan/CPG/CPG%20T2DM%202015.pdf (accessed May 17, 2018).
3. The Royal Australian College of General Practitioners. General practice management of type 2 diabetes:. 2016-2018. 2016: Available at: http://www.racgp.org.au/your-practice/guidelines/diabetes/ (accessed May 17, 2018).
4. National Institute for Health and Care Excellence (NICE) UK. The management of type 2 diabetes2014; (1-54): Available at: https://www.nice.org.uk/Guidance/NG28 (accessed May 17, 2018).
5. American Diabetes Association. Standards of medical care in diabetes. Diabetes Care. 2016;39(suppl 1):S1-S103.
6. World Health Organization. Global report on diabetes. Geneva: Geneva: WHO; 2016.
7. Ladhani NN, Majumdar SR, Johnson JA, Tsuyuki RT, Lewanczuk RZ, Spooner R, Simpson SH. Adding pharmacists to primary care teams reduces predicted long-term risk of cardiovascular events in type 2 diabetic patients without

established cardiovascular disease: results from a randomized trial. Diabet Med. 2012 Nov;29(11):1433-1439. https://doi.org/10.1111/j.1464-5491.2012.03673.x

8. Nishita C, Cardazone G, Uehara DL, Tom T. Empowered diabetes management: Life coaching and pharmacist counseling for employed adults with diabetes. Health Educ Behav. 2013;40(5):581-591. https://doi.org/10.1177/1090198112465088
9. Butt M, Mhd Ali A, Bakry MM, Mustafa N. Impact of a pharmacist led diabetes mellitus intervention on HbA1c, medication adherence and quality of life: A randomised controlled study. Saudi Pharm J. 2016;24(1):40-48. https://doi.org/10.1016/j.jsps.2015.02.023
10. Samtia AM, Rasool MF, Ranjha NM, Usman F, Javed I. A multifactorial intervention to enhance adherence to medications and disease-related knowledge in type 2 diabetic patients in Southern Punjab, Pakistan. Trop J Pharm Res. 2013;12(5):851-6. https://doi.org/10.4314/tjpr.v12i5.28
11. Mourão AO, Magalhães, Ferreira WR, Martins MA, Parreiras, Reis AM, Moreira, Carrillo MR, Gaede, Guimarães AG, Ev LS. Pharmaceutical care program for type 2 diabetes patients in Brazil: a randomised controlled trial. Int J Clin Pharm. 2013 Feb;35(1):79-86. https://doi.org/10.1007/s11096-012-9710-7
12. Ayadurai S, Hattingh HL, Tee LBG, Md Said SN. A narrative review of diabetes intervention studies to explore diabetes care opportunities for pharmacists. J Diabetes Res. 2016;2016:5897452. https://doi.org/10.1155/2016/5897452
13. Conley MP, Chim C, Magee CE, Sullivan DJ. A review of advances in collaborative pharmacy practice to improve adherence to standards of care in diabetes management. Curr Diab Rep. 2014;14(3):470. https://doi.org/10.1007/s11892-013-0470-0
14. Luetsch K. Attitudes and attributes of pharmacists in relation to practice change – A scoping review and discussion. Res Social Adm Pharm. 2017;13(3):440-455. https://doi.org/10.1016/j.sapharm.2016.06.010
15. Ayadurai S, Sunderland VB, Tee LBG, Hattingh HL. Consensus Validation of Simpler: A Tool to Improve Pharmacist Delivery of Quality, Evidence-Based Diabetes Care. Curr Diabetes Rev. 2018;14(6):565-575. https://doi.org/10.2174/1573399814666171215115239
16. Eldridge SM, Lancaster GA, Campbell MJ, Thabane L, Hopewell S, Coleman CL, Bond CM. Defining feasibility and pilot studies in preparation for randomised controlled trials: development of a conceptual framework. PLoS One. 2016;11(3):e0150205. https://doi.org/10.1371/journal.pone.0150205
17. Creswell JW. Qualitative inquiry & research design : choosing among five approaches. 3rd ed. Thousand Oaks: Sage; 2013.
18. Morse JM. Qualitative health research : creating a new discipline 1st ed. Walnut Creek, CA: Left Coast Press; 2012.
19. Awaisu A, Alsalimy N. Pharmacists' involvement in and attitudes toward pharmacy practice research: A systematic review of the literature. Res Social Adm Pharm. 2015;11(6):725-748. https://doi.org/10.1016/j.sapharm.2014.12.008
20. Kritikos VS, Saini B, Carter S, Moles RJ, Krass I. Factors influencing pharmacy students' attitudes towards pharmacy practice research and strategies for promoting research interest in pharmacy practice. Pharm Pract (Granada). 2015;13(3):587. https://doi.org/10.18549/PharmPract.2015.03.587
21. Steinar Kvale. Interviews: An introduction to qualitative research interviewing. Thousand Oaks, CA: Sage; 1996.
22. Tong A. Consolidated criteria for reporting qualitative research COREQ : 32 item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-357. https://doi.org/10.1093/intqhc/mzm042
23. Schensul. JJ, LeCompte. MD. Designing and conducting ethnographic research: An introduction. Walnut Creek, CA: Altamira Press; 2010.
24. IBM Corp. IBM SPSS Statistics for Windows, Version 22. Armonk, NY: IBM Corp,; 2013.
25. Boyatzis R. Transforming qualitative information:thematic analysis and code development. Thousand Oaks, CA: Sage; 1998.
26. QSR International Pty Ltd. NVivo qualitative data analysis Software, Version 10. 2012.
27. eTG complete. Melbourne: Therapeutic Guidelines Limited; July 2017.
28. Adepu R, Shariff A. Development, validation and implementation of continuous professional development programmes for community pharmacists. Indian J Pharm Sci. 2010;72(5):557-563. https://doi.org/10.4103/0250-474X.78520
29. Battaglia JN, Kieser MA, Bruskiewitz RH, Pitterle ME, Thorpe JM. An online virtual-patient program to teach pharmacists and pharmacy students how to provide diabetes-specific medication therapy management. Am J Pharm Educ. 2012;76(7):131. https://doi.org/10.5688/ajpe767131
30. Saini B, Shah S, Kearey P, Bosnic-Anticevich S, Grootjans J, Armour C. An interprofessional learning module on asthma health promotion. Am J Pharm Educ. 2011;75(2):30.
31. Wheeler A, Fowler J, Hattingh L. Using an intervention mapping framework to develop an online mental health continuing education program for pharmacy staff. J Contin Educ Health Prof. 2013;33(4):258-266. https://doi.org/10.1002/chp.21198
32. Anthierens S, Tonkin-Crine S, Douglas E, Fernandez-Vandellos P, Krawczyk J, Llor C, Cals JWL, Francis NA, Yardley L, Coenen S, Verheij T, Goossens H, Little P. General practitioners' views on the acceptability and applicability of a web-based intervention to reduce antibiotic prescribing for acute cough in multiple European countries: a qualitative study prior to a randomised trial. BMC Fam Pract. 2012;13:101. https://doi.org/10.1186/1471-2296-13-101
33. Litvin CB, Ornstein SM, Wessell AM, Nemeth LS, Nietert PJ. Use of an electronic health record clinical decision support tool to improve antibiotic prescribing for acute respiratory infections: The ABX-TRIP study. J Gen Intern Med. 2013;28(6):810-816. https://doi.org/10.1007/s11606-012-2267-2
34. Murphy A. The community pharmacy SIMPLE approach to asthma management: Regional innovation fund (RIF) project evaluation report. Leicester City University Hospitals of Leicester, Trust N;2012.
35. Basger BJ, Chen TF, Moles RJ. Inappropriate medication use and prescribing indicators in elderly Australians: Development of a prescribing indicators tool. Drugs Aging. 2008;25(9):777-793. https://doi.org/10.2165/00002512-200825090-00004

36. Paxton AE, Strycker LA, Toobert DJ, Ammerman AS, Glasgow RE. Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals. Am J Prev Med. 2011;40(1):67-71. https://doi.org/10.1016/j.amepre.2010.10.009
37. Weed LL. New connections between medical knowledge and patient care. BMJ. 1997;315(7102):231-235. https://doi.org/10.1136/bmj.315.7102.231
38. Jim Hales AA, Tim Staniford, Jane Manser. Evaluation of the diabetes pilot program: final report. Canbera: Australian Government; 2010.
39. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. Am J Hosp Pharm. 1990;47(3):533-543.
40. Nutrition Society of Malaysia. Nutriweb. Malaysia2016; Available at: http://www.nutriweb.org.my/index.php?healthy-eating-section (accessed May 17, 2018).
41. The National Diabetes Services Scheme. Diabetes Australia. Available at: https://www.ndss.com.au/publications-resources (accessed May 17, 2018).
42. Spiro R. The impact of electronic health records on pharmacy practice. Drug Topics. 2012;(Apr):46-54.
43. Salter SM, Karia A, Sanfilippo FM, Clifford RM. Effectiveness of e-learning in pharmacy education. Am J Pharm Educ. 2014;78(4):83. https://doi.org/10.5688/ajpe78483
44. Pharmaceutical Services Division. Medication therapy adherence clinic (MTAC): Diabetes. Malaysia: Ministry of Health; 2014. Available at: https://www.pharmacy.gov.my/v2/sites/default/files/document-upload/mtac-diabetic.pdf (accessed May 17, 2018).
45. Pharmaceutical Society of Australia. Guidelines for pharmacists providing medicines use review (MedsCheck) and diabetes medication management (Diabetes MedsCheck) services. Available at: https://www.ppaonline.com.au/wp-content/uploads/2019/01/PSA-MedsCheck-Guidelines.pdf (accessed May 17, 2018).

Lee J, Ladoni M, Richardson J, Sundar RP, Bix L. Investigating the efficacy of an interactive warning for use in labeling strategies used by us pharmacies. Pharmacy Practice 2019 Apr-Jun;17(2):1463.
https://doi.org/10.18549/PharmPract.2019.2.1463

Original Research

Investigating the efficacy of an interactive warning for use in labeling strategies used by us pharmacies

Jiyon LEE, Moslem LADONI, James RICHARDSON, Raghav P. SUNDAR, Laura BIX.
Received (first version): 4-Feb-2018 Accepted: 9-Jun-2019 Published online: 14-Jun-2019

Abstract

Background: United States pharmacies repackage medications into multi-dose vials, enabling customized dosing for prescription drugs. Investment in infrastructure has made this the predominant approach to packaging for US prescriptions. Although recent changes to labeling now discourage the use of auxiliary labels (small stickers highlighting information germane to the safe and effective use), they are still allowed by USP<17>, provided their use comes from an evidence-based perspective.

Objectives: Evaluate how 'interactive,' placements of auxiliary labels (placement requiring physical manipulation of the warning to accomplish a task (e.g. opening)) garner attention as compared to those placed vertically or horizontally.

Methods: Ninety-six participants were eye tracked while opening three prescription vials (each with an auxiliary warning label with a different placement: vertical, horizontal and interactive). Recall and recognition were tested subsequently. Linear mixed models were used to analyze the continuous variables while the binary response variables were analyzed using generalized linear mixed models. The effect of auxiliary labels was fitted as a fixed effect and the subject-to-subject variation was considered as a random effect in the model. Participants' age, health literacy and sex were added to the models if their effect was statistically significant at alpha=0.05.

Results: The placement of the warnings significantly impacted the time spent viewing the information they contained at alpha=0.05; people spent significantly longer on interactive placements (0.96; SD 0.13 seconds) than either, horizontal placements (0.27; SD 0.037 seconds) or those placed vertically (0.18 seconds; SD 0.035). Participants were equally as likely to see information presented in an interactive placement (90%; SD 3.8) or horizontal placement (78%; SD 05.5) but less likely to view warnings placed vertically (60%; SD 6.9). Free recall responses also supported the use of interactive placement (62%; SD 6.8 recall) as compared to horizontal placements which were 29%; SD 3.0 and 20%; SD 6.0 for vertical placements.

Conclusions: Data provides evidence which suggests that interactive and horizontal placements out-perform auxiliary labels placed vertically on prescription vials with regard to garnering patient attention.

Keywords

Prescription Drugs; Drug Packaging; Product Labeling; Health Literacy; Mental Recall; Attention; Pharmacies; Fixation, Ocular; Cross-Sectional Studies; United States

INTRODUCTION

Pharmaceuticals play an important role in extending and ensuring quality of life. Although there are a myriad of benefits associated with medication use, there are certain risks as well. Errors have the potential to occur throughout the entire process, from manufacturing through dosing. Any error, regardless of where it occurs in the process is termed a "medication error." The National [United States (US)] Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) defines medication error as: "Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer".[1]

Medication errors are a costly problem in the US; in 2006, the Institute of Medicine reported that 1.5 million medication errors cost an estimated USD 3.5 Billion annually.[2] While there are several ways to reduce these errors, labeling has been indicated to be one of the most important sources of information about prescription drugs and, therefore, a critical factor in their safe and effective use.[3,4]

Pharmacies in the US frequently remove drugs from the drug manufacturer's packaging to repackage the product into multi-dose, plastic vials made from polyethylene terephthalate (PET) or polypropylene (PP) that are generally blue, green, or amber in color. This enables pharmacies to precisely follow customized physician orders (i.e. a doctor's precise prescriptions for an individual). An infrastructure dedicated to filling prescriptions into these multi-dose vials, in the form of semi-automated and fully-automated equipment located within the pharmacy or in central-fill and regional-fill locations has made this the predominant method for dispensing prescriptions by US pharmacies.

Consequently, much of the labeling information that is provided to US patients is produced by the pharmacy and regulated by the State Boards of Pharmacy. Auxiliary warnings, also called prescription warning labels (PWLs), are "small colored stickers placed *adjacent* [emphasis added] to the drug label on a prescription bottle" by pharmacy personnel.[5-9] Label placement, the information contained within, and even the information relative to the

Jiyon LEE. MS. School of Packaging, Michigan State University. East Lansing, MI (United States). leejiyo4@msu.edu
Moslem LADONI. PhD. Statistical Consulting Center, CANR Biometry Group, Michigan State University. East Lansing, MI (United States). moslemladoni@gmail.com
James RICHARDSON. BS. School of Packaging, Michigan State University, East Lansing, MI (United States). Richardsonjar@yahoo.com
Raghav P. SUNDAR. PhD. School of Packaging, Michigan State University, East Lansing, MI (United States). raghavprashant.sunda@cardinalhealth.com
Laura BIX. PhD. School of Packaging, Michigan State University, East Lansing, MI (United States). bixlaura@msu.edu

specific drugs, are not uniformly standardized or required.[6,10] Decisions regarding their application and use are, instead, left to the discretion of the pharmacist. That said, because they are intended to highlight information critical to the safe use of medications, it is important that patients heed the information they contain.[6,9]

Research focused on varied aspects of auxiliary labels generally concludes their performance is sub-optimal. Numerous researchers suggest that patients at risk for low literacy have varying difficulties with these labels.[1,5,6,11-13] Shiyanbola *et al*. concluded patients with poor health literacy were less likely to attend auxiliary warning information than those with higher health literacy scores.[6,9] Davis *et al*. expanded understanding of how those with poor literacy struggle with these labels, concluding patient comprehension of warning labels was associated with health literacy scores (i.e. patients with low literacy had lower comprehensions of label messages).[11,12] Labels redesigned by Locke *et al*. which were tested by English-speaking, minority populations resulted in better rates of comprehension when compared with existing warnings.[5] Additionally, the team found a statistically significant association between higher levels of education/higher literacy scores and better interpretation of label messages.[10]

Wolf *et al*. investigated how 500 adult patients interpreted auxiliary labels comprised of varying treatments (available, standard warnings; warnings with simplified text; and plain language icons which were developed with patient feedback).[13] Available, standard warnings were correctly interpreted with significantly less frequency than either the simplified text or the plain language icons that were tested ($p<0.001$), leading the research team to conclude that the use of simple, explicit language on warning labels would increase understanding among patients and that there is a need to "promote patient-centered prescription labeling practices."

Findings such as these have encouraged researchers and standards bodies to call for a revised approach to prescription labeling in the US.[2,6,13-15] Heeding the call of Wolf's team to develop patient-centered recommendations for improvement, Shiyanbola *et al*. qualitatively investigated new label designs developed by their research team.[6,13] The team explored both the message content (wording) and formatting of the messages. Recommendations for label improvement included: the use of bigger and bolder fonts, highlighting of warning instructions and placement on the package front. They concluded that even the redesigns proposed by the team needed further work to enhance the clarity and understandability of label information.[6,7] Conclusions drawn by the Shiyanbola team are well-aligned with recommendations made by Bailey *et al*. after their systemic review of 31 articles comprised of research on how to improve prescription labeling for patient use.[7,15] Recommendations suggested that the use of "plain language, improved formatting and organization and more explicit instructions" would enhance patient comprehension.[7]

A second systematic review of the literature conducted by Wali *et al*. bolstered the importance of revising the approach to labeling.[16] They reviewed literature that investigated how interventions impacted medication knowledge and adherence among participants with low health literacy. Final analysis of 47 articles published between 2004 and 2015 demonstrated "significant improvement in knowledge in 27 of 37 interventions and a significant improvement of adherence in 19 of 26 interventions", leading researchers to suggest that interventions designed in support of those with poor health

Table 1. Seven sections contained within USP<17> Prescription Container Labeling – Prescription Container Label Standards to Promote Patient Understanding

1. Organize the prescription label in a patient-centered manner	Organized in a way that best reflects how patients seek and understand. Feature only the most important patient information needed for safe and effective use.
2. Emphasize instructions and other information important to patients	
3. Simplify language	Clear, simple, concise and familiar language should be used. Use common terms and sentences without medical jargon.
4. Give explicit instructions	Clearly separate dose and timing to explicitly convey the time persions of the day. E.g. "1 tablet in the morning and 1 tablet in the evening" rather than "1 tablet twice a day" Avoid ambiguous directions such as "take as directed"
5. Include purpose for use	Purpose should be included (if in Rx unless patient prefers it not). Use simple terminology related to purpose (e.g. for "high blood pressure" rather than "for hypertension."
6. Limit auxiliary information	Auxiliary information present should be evidence based in simple explicit language presented in a standardized manner and critical for patient understanding and safe use. Use icons only where adequate evidence is present for improved understanding. Applied consistently and does not depend on individual practitioner choice.
7. Address limited English proficiency	Patient's preferred language, where possible in redundant English, Drug name shall be in English for use by Emergency personnel
8. Improve readability	Adequate contrast, Simple uncondensed fonts with adequate kerning, Appropriate sentence case, Adequate font size, Adequate leading (space between lines), White space to distinguish different sections, Horizontal positioning of text, No truncation or abbreviation, Limit use colors/highlighting, Separate lines to distinguish dosing, Provide alternative access for visually impaired patients and services or direct to patient alternative access

literacy improve both patient knowledge and medication adherence.

The growing body of findings and urgings from the research community have prompted the United States Pharmacopeial Convention (USP) and the National Association of Boards of Pharmacy (NABP) to work to develop patient-centered standards for prescription container labels with the intention of improving the understanding of label information.[6,17] The USP General Chapter <17>, Prescription Container Labeling, published in the USP 36-NF31, became an official standard on May 1, 2013, and was revised in May 2014 to include guidance regarding enhanced accessibility for visually impaired patients.[17] The document's intention is to "provide a universal approach to the format, appearance, content and language of instructions for medicines in containers dispensed by pharmacists".[18]

The Chapter contains seven directives which are presented in Table 1. Although the standard suggests limiting the use of auxiliary labels (see Table 1), it indicates that when they are used, decisions should come from an evidence-based frame. The vast majority of the evidence regarding auxiliary labels focuses on late stage information processing; that is, research tends to focus on designing message content in ways that make it comprehensible by varied audiences. Although this is an obvious (and important) aspect of these messages, in order for information to be effective, a commonly used model originally proposed by Dejoy and adapted by de la Fuente postulates that five, serialized steps of interaction must occur between the viewer and the information (see Table 2).[19,20] Under this construct, information processing occurs in a linear, serialized fashion; each step requisite for subsequent steps. As such, if a person fails to notice a warning label (early stage processing; stages 1 and 2), all further processing is moot; the message has failed. In other words, to get to the point where you comprehend the message you must first attend to it.

In light of Wogalter *et al*. research recommending that warnings (for any product) be presented in a placement where consumers anticipate their presence, and Wolf and Davis' findings that consumers rarely rotate medication vials to seek information, the lack of standardized placements for auxiliary labels, and the critical information that they contain, is concerning.[21,22] Laughery and Stanush suggest that consumers afford products more serious consideration when explicit warning labels are present, and that explicit warning labels help consumers to comprehend hazards as well as utilize appropriate safety precautions.[23] All of this suggests that when auxiliary labels are used, they should be optimized in ways that garner attention, that placement in a position that is likely to be noticed is an important feature.

Considering the fact that USP Chapter <17> continues to allow for use of auxiliary labels, and indicates that if used, they should be used in "evidence based" ways, we investigated how their placement on prescription vials impacts their ability to garner attention and be read, recognized and recalled. Specifically, we investigated applying the concept of "interactivity" defined by Hunn and Dingus as a warning that "requires physical manipulation" in order to accomplish a necessary task with a product, in our case, opening the vial, to auxiliary labels.[24] Some researchers have suggested the noticeability (perception-Stage 2 of Table 2) of interactive labels to be their most important attribute.[25] Specifically, because interactive messages (warnings) are more likely to be read, it stands to reason that readers are also more likely to comply with their instructions.[24] The best-known example of an interactive warning is a "lock-out tag". During an activated lockout, employees who wish to operate a machine must remove a tag prior to unlocking a power source. In other words, when lockout tags are placed, switches that control critical processes are labeled in such a way that tags must be removed prior to reactivation of power.

We became interested in both how a pharmacist's placement of auxiliary labels (i.e. vertical, horizontal or interactive. See Figure 1), impacted the patient's early stage processing of the information they contained (i.e. their ability to notice Table 2 Stage 2), and whether or not the benefits of interactive warnings found in other fields would transfer to the use of auxiliary labels by US pharmacists.[10,24,25]

Table 2. Serialized information processing model

	Stage of Processing	Descriptions
Step 1	**Exposure** (Patients must be exposed to the information).	The information must be available for the consumer to act upon. If, for instance, the presence of an allergen is not noted in the labeling present with the product, the allergic viewer cannot make an informed decision regarding rejection of the therapy
Step 2	**Perception** (Patients must perceive or notice the information using one of their senses).	The consumer must perceive the message using one or more of their five senses. In the previous case, the consumer must direct their gaze to the auxiliary labels that highlights the presence of the allergen.
Step 3	**Encodation** (Patients must devote cognitive resources to the signal brought in through the eyes to convert the external signal into an internal one for interpretation by the brain)	The external signal captured by the eyes is converted into an internal impulse that can be processed by the brain. If inadequate cognitive resources are available (e.g. the viewer is multitasking and cannot devote sufficient cognitive resources to the conversion/processing), the signal will fail.
Step 4	**Comprehension** (Patients must understand what has been presented)	If the allergen message is in a language that is unfamiliar to the viewer, at a reading level beyond their comprehension, or a symbol that they find confusing, the message will fail.
Step 5	**Execution** (Patients activate the motor system to act on the information)	After processing the signal fully, the viewer activates their motor systems to execute on decision making. The action that they execute may (or may not) be congruent with what the label attempts to communicate. For example, the viewer may realize that there is an allergen present that is potentially harmful to them, but that the benefits of taking the product outweigh the risk and dose themselves with the product.

Figure 1. Placement of auxiliary warning labels on push and turn closure vial

The aim of this study was to objectively characterize how auxiliary label placement (three treatments- vertical, horizontal and interactive. See Figure 1) impacts early stage information processing (attention; Table 2, Step 2).

METHODS

Testing was conducted in accordance with procedures approved under MSU (Michigan State University) SIRB #11-1207. A written consent process was employed, and participants were tested at the Packaging HUB (Human Factors, Universal Design and Biomechanics) laboratory on the campus of MSU.

Subject Recruitment

A total of ninety-six participants were tested comprised of two age groups, "older" (50+) and "younger" (18-29). Age groups were selected based on the work of Sundar *et al*. which examined the effect of color of auxiliary labels on their ability to garner attention using eye tracking, which identified significant differences in the information search behaviors used by these populations.[26] Older participants were recruited through email advertisement and word of mouth utilizing local churches and service clubs (e.g. Kiwanis) in the Mid-Michigan area (US). Younger adults were recruited via email and word of mouth through university networks. To be eligible to participate in the study, subjects needed to be: 18-29 years of age or over 50 years of age, administer their own medications and have transportation to campus where the study took place. Subjects were excluded if they were legally blind or wore hard contact lenses (which had the potential to interfere with eye tracking).

After written consent was obtained, participants were characterized using a basic demographic survey. Additionally, their near-point visual acuity was assessed using a Dow Corning Opthalmics' card capable of measuring visual acuity from 20/20 to 20/120. Participants were then characterized using the Rapid Estimate of Adult Literacy in Medicine- Revised technique, (REALM-R), a shortened version of REALM.[27] The shortened version is a word recognition test consisting of 11 items (two unscored) commonly used to identify people at risk for poor health literacy whose first language is English. A participant receiving a score of 6 or less is characterized as "at risk."

Stimulus Materials

Standard amber vials in a 60 Dram size were outfitted with a push and turn closure (Owens-Illinois, OH). Each trial was comprised of a single vial containing an auxiliary label in one of the three placements (interactive, horizontal or vertical- See Figure 1) in addition to a white pharmacy label created by the campus pharmacy. Each participant viewed all three placements one at a time, participating in a total of three trials. All auxiliary labels were 7 cm x 1 cm with black font on yellow background. To alleviate any potential effects related to message content, messages were chosen from those utilized in US pharmacies after they were evaluated with a Flesch Reading Ease test. This evaluation tool is imbedded within Microsoft Word and provides a measure of reading difficulty of a message for English speaking adults. According to the original article by Flesch, a range of 60 to 70 is regarded as "standard difficulty;" more current interpretations of this result suggest messages scoring in this range to be easily understandable by 8th and 9th graders.[28,29] The three common medication warnings selected for use which had identical Flesch scores (66.7; See Figure 2) were: (1) 'SHAKE WELL AND KEEP IN THE REFRIGERATOR'; (2) 'WARNING: USE THIS DRUG ONLY AS DIRECTED'; and (3) 'DO NOT DRIVE WHILE TAKING THIS MEDICATION'

Determining treatment combinations (3 placements x 3 messages) =9 possible treatment combinations- Each participant sees 3 of the 9 (incomplete block design)

	SHAKE WELL AND KEEP IN THE REFRIGERATOR.	WARNING : USE THIS DRUG ONLY AS DIRECTED.	DO NOT DRIVE WHILE TAKING THIS MEDICATION.
Vertical	1	2	3
Horizontal	4	5	6
Interactive	7	8	9

If treatment1 is selected (shake well message in a vertical placement), treatments 2, 3, 4 and 7 are eliminated from the consideration set as possible treatments for the participant to test; as such, only combination 5, 6, 8 and 9 are available for them to test.

	SHAKE WELL AND KEEP IN THE REFRIGERATOR.	WARNING : USE THIS DRUG ONLY AS DIRECTED.	DO NOT DRIVE WHILE TAKING THIS MEDICATION.
Vertical			
Horizontal		5	6
Interactive		8	9

In this example, the theoretical participant was assigned treatment 1 and then treatment 5 (Warning: Use../horizontal placement). This eliminates treatments 8 and 6 from the consideration set, leaving them with 1, 5 and 9. It takes a total of 36 participants to fill a complete block design, counterbalancing all possible combinations of message and placement.

	SHAKE WELL AND KEEP IN THE REFRIGERATOR.	WARNING : USE THIS DRUG ONLY AS DIRECTED.	DO NOT DRIVE WHILE TAKING THIS MEDICATION.
Vertical			
Horizontal			
Interactive			9

Figure 2. Counter balancing scheme

In order to avoid potential confounds with run order, a carefully devised counterbalanced, incomplete block design was employed. The three selected messages were crossed with placement (vertical, horizontal, interactive- see Figure 1) for a possible nine combinations (3×3). However, to also control for potential effects of run order, a total of 36 subjects (9×4×1) were needed to satisfy the blocked counterbalanced design in this incomplete block approach. Figure 2 depicts the scheme that was used for identification of treatments by subject.

Eye-Tracking Test: Eye-tracking was conducted using a mobile eye-tracker (Applied Science Laboratories; Boston, MA). A customized calibration board (See Figure 3) was used to calibrate each participant by instructing them to direct their gaze to multiple, different points spread across the likely range of gaze. The board was specifically created with our research in mind. Calibration dots were concentrated in areas where the gaze was likely to be directed based on the task at hand. Using this technique, the gaze trail was calibrated to a predetermined visual plane while incorporating the unique biology of the individual (e.g. eye shape) in order to obtain greater accuracy of gaze tracking. During the calibration process, each participant was asked to look at a calibration dot on the right side of the calibration board followed by its doppelganger partner on the opposite side of the board. After directing the participant to view seven dots spread throughout the calibration board, they were also asked to turn their head slight to the right, and then, look at dots on left, right, top and bottom side of the plane. This process was repeated until the calibration was accurate; accuracy was tested by asking participants to direct their gaze to calibration dots scattered throughout the board, verifying the proximity of their gaze.

After calibration, the researcher instructed each participant using the following trigger script: “I will give you three packages, each of which contains a vial. When you get these packages, I would like you to open the package and

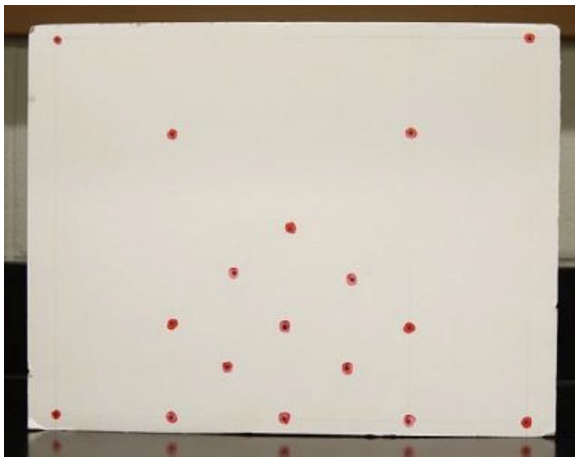

Figure 3. Customized calibration board

then take out the vial and open it as you usually would. Imagine that this medication is new to you, and you just obtained it from the pharmacy". A series of three pharmacy bags were handed to the participant one at a time; each bag contained a single trial comprised of one of the three placements so that each participant provided one observation on one of each treatment type (i.e. horizontal placement, vertical placement and interactive placement). Opening time was not prescribed. The dependent variable "total time spent on auxiliary warning label" represents the (summed) amount of time the eyes were recorded in the zone comprising the warning label; this value was calculated for each of the three placements (horizontal, vertical or interactive) for each subject. The "time to first hit" represents the time that elapsed before the subject's eye entered the zone which defines the auxiliary label. We also analyzed the auxiliary label in binary fashion, specifically, whether or not the subject's gaze was directed to the information in the warning label at all (y/n).

Recall Test: Once a participant had viewed all three vials, the eye tracker was removed, and tests of 'recall' and 'recognition' were conducted. During the 'recall' test, participants were provided a blank sheet of paper and asked to write down everything that they could recall from the eye tracking test. The dependent variable for the test of recall was categorized in binary fashion (recalled yes/no); analysis was conducted as follows. Free recall responses were reviewed post-hoc and recorded in three columns of the spreadsheet: (1) specific to information content (positively for that placement if they said something about the message contained in a specific placement for that participant-e.g. "I remember one said store in the refrigerator"); (2) specific to the placement (e.g. I remember there was a label across the bottom of the vial); and (3) generally, if the treatment had triggered either of the first two categories affirmatively (i.e. the subject remembered the information from a placement and/or the position of the label).

Recognition Test: Immediately after completing the recall test, participants were handed a diagram comprised of six auxiliary label messages (three of which they had viewed and three which they had not- See Figure 4). They were asked to indicate the three messages that they had just viewed by circling them on the sheet (a test of recognition).

As with the recall, the recognition response analysis was coded as: correctly identified as seen, or correctly rejected as not seen or the corollary of each.

Statistical analysis

Statistical analysis of the data was conducted in SAS (Version 9.2, SAS institute Inc., Cary, NC). The data contained two types of response variables, continuous and binary. Different models were fitted for each response variable and the type of fitted model was chosen based on the type of response variable in the model.

We evaluated three response variables collected with the eye tracker. Namely:

- The time participants spent attending the auxiliary warning label (in seconds, a continuous variable)
- The probability of noticing the auxiliary warning label yes/no (probability of binary variable)
- The time it took to first hit the auxiliary warning label (in seconds, a continuous variable)

The total time spent on a zone was analyzed by fitting a linear mixed model using PROC MIXED in SAS. The effect of label placement, age and gender and their interactions were fitted as the fixed effects in the model. The effect of subjects was accounted for as a random effect in the model. The model initially included health literacy and number of prescription drugs per day, however, none of these variables had a significant effect on the response variable based on Type 3 test p-value ($p>0.05$), hence, they were dropped from the model. Visual inspection of residuals and Shapiro-Wilk test indicated that the data was not normally distributed. The data was log transformed to meet the normality assumption in the analysis and then back-transformed for presentation herein.

Figure 4. The diagram of recognition test

Table 3. Characterization of Participant Population by Age Group, Sex and Measured Near-Point Visual Acuity

	Young adults (18-29)	Older adults (50+)	Total
Sex			
Female	21 (67.7 % of those 18-29)	21 (61.8% of the 50+ group)	42 (64.6% of Total)
Male	10 (32.3% of those 18-29)	13 (38.2% of the 50+ group)	23 (35.4% of Total)
Totals by sex and age	31 (47.7 % of Participants were 18-29)	34 (52.3% of Participants were 50+)	65
Visual acuity			
20/20	15 (48.4% of those 18-29)	10 (29.4% of those 50+)	25 (38.5% of Total)
20/30	12 (38.7 % of those 18-29)	15 (44.1% of those 50+)	27 (41.5% of Total)
20/40	2 (6.5% of those 18-29)	4 (11.8% of those 50+)	6 (9.2% of Total)
20/50	2 (6.4% of those 18-29)	3 (8.8% of those 50+)	5 (7.7% of Total)
20/60 and below	0	2 (5.9% of those 50+)	2 (3.1% of Total)
Totals by visual acuity and age	31 (47.7% of Participants were 18-29)	34 (52.3% of Participants were 50+)	65

When the eye tracker registered any time in an auxiliary label placement zone (horizontal, vertical or interactive), data related to that placement was coded as a yes ('1'). To test for significant effects, the response variable, the probability of noticing a zone, was modeled as a binary response. This was analyzed by fitting a generalized linear mixed model using PROC GLIMMIX in SAS. Auxiliary warning label placement was modeled as the fixed effects and subject effects were accounted for by fitting subject as a random effect in the model. Of the tested effects, only placement suggested evidence of significance based on a Type 3 test p-value (p>0.05). Thus, the final model included only the fixed effect of placement.

The time to first hit the auxiliary warning label (after log transformation to fulfill normality assumptions) was analyzed by fitting a linear mixed model using PROC MIXED in SAS. Age group and sex were included in the model initially but were dropped because these variables did not improve the model fit based on Type 3 test p-value (p>0.05). Thus, only auxiliary label placement was included in the model.

The model was fitted using a generalized linear mixed model. A binary distribution with logit Link function was used to model the probability of recalling the test by the subjects. In addition to auxiliary label placement, age group and sex were included in the model at the beginning stage of analysis but did not yield evidence of significant differences at alpha=0.05, so these were removed from the final model; placement was included as results suggested its significant effects (p=0.0021). Similar to the rest of the models, subject-to-subject variations were accounted by the random effects in the model. Pairwise comparisons were conducted using Fisher's LSD at alpha=0.05.

Recognition was tested in the same fashion as recall test. The effect of health literacy, number of prescription drugs per day, and age were included in the model at the beginning stage of analysis, but all of them were dropped because the effects did not show evidence of significance to model fit based on Type 3 test p-value (p>0.05). Pairwise comparisons (row comparisons) were conducted using Fisher's LSD at alpha=0.05.

RESULTS

Participants

Ninety-six participants were recruited. Sixty-five were included in the analysis (42 females and 23 males). From the 96, 28 were excluded because the viewing angle of vial handling occluded tracking of the eye for significant portions of the testing, and three were excluded because of difficulties associated with the computer files. Of the participants included in the analysis (see Table 3), the older group (50+) was comprised of 34 participants (aged 50-86, Ave. 59.12, SD 8.22 years); 21 were female (aged 50-86, Ave. 58.10, SD 8.56 years) and 13 male (aged 50-75, 60.77, SD 7.44 years). There were 31 in the younger group (Ave. 23.68 , SD 3.31 years); 21 were female (aged 18-29, Ave. 22.76, SD 3.23 years) and 10 male (aged 20-29, 25.60, SD 2.62 years). Table 3 characterizes participant frequency age group, sex and measured near-point visual acuity.

Health literacy and visual acuity

None of the participants were indicated to be at risk for poor health literacy according to our REALM-R testing. That is, they scored at a 6 or below when reading aloud the 9 scored words associated with healthcare which are dictated

Table 4. Eye tracking results for all response variables

	Vertical Placement	Horizontal Placement	Interactive Placement
The total time (seconds) spent on the auxiliary label when placed in different orientations (seconds)	0.18; SD 0.035[a]	0.27; SD 0.037[a]	0.96; SD 0.13[b]
Interpretation Total time viewing warnings- Among those that saw the warning labels, participants spent significantly longer (0.96 seconds viewing labels that were placed in the interactive placement than either of the other two placements (0.27 seconds for those placed horizontally and 0.18 seconds for those placed vertically); difference- at 95% confidence is indicated by the differing superscript letter (a versus b). There was no evidence of a difference when the total time spent on vertical and horizontal placements were compared to one another (as indicated by the same letter, b)			
The time to first hit of the auxiliary label (seconds)	6.24; SD 1.12[a]	4.43; SD 0.72[a]	4.55; SD 0.63[a]
Interpretation Time to first hit- There was no evidence that the placement of label information (vertical, horizontal or interactive) impacted the time that it took to locate the information among those that did see it (as indicated by the same letter [a])			
Probability of noticing a zone (proportion of those registering time in the zone of interest)	0.60; SD 0.069[a]	0.78; SD 0.055[b]	0.90; SD 0.038[b]
Interpretation of Probability of noticing a zone- Significantly more participants viewed the label placed interactively (90%) and horizontally (78%) than those placed in the vertical format (60%). These comparisons were statistically significant at a 95% confidence interval (as indicated by the differing superscripts [a] and [b]. There was no evidence of a difference when performance of horizontal 78% and interactive (90%) were compared.			
* Row pairwise comparison was conducted at alpha=0.05 within each of the three dependent variables of interest.			

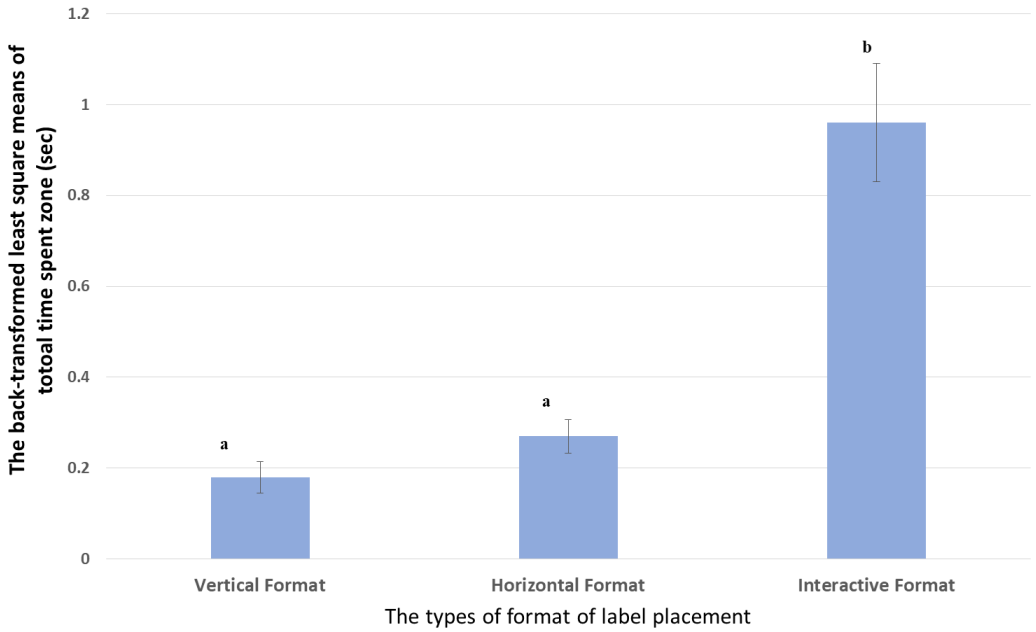

Figure 5. The result of the back-transformed least square means of total time spent a zone
Comparisons were conducted at alpha=0.05 (95% Confidence) and differences are indicated as different superscripts

by the test. This was likely due to the recruiting techniques, which heavily leveraged organizations in close proximity to campus.

Eye-Tracking: As mentioned in the methods, the effect of placement (vertical, horizontal and interactive) was assessed for its impact on three dependent variables (See Table 4: the total time that participants spent viewing a specific auxiliary label, the probability of noticing the auxiliary label (i.e. that the information in the auxiliary label was seen at all), and the time it took them to until their eyes first fixated the information on the warning. A summation of the analysis for all dependent variables related to the eye tracking methods with statistical comparisons are presented in Table 4.

The total time spent on an auxiliary warning label, based on placement: Pairwise comparisons yielded no evidence of

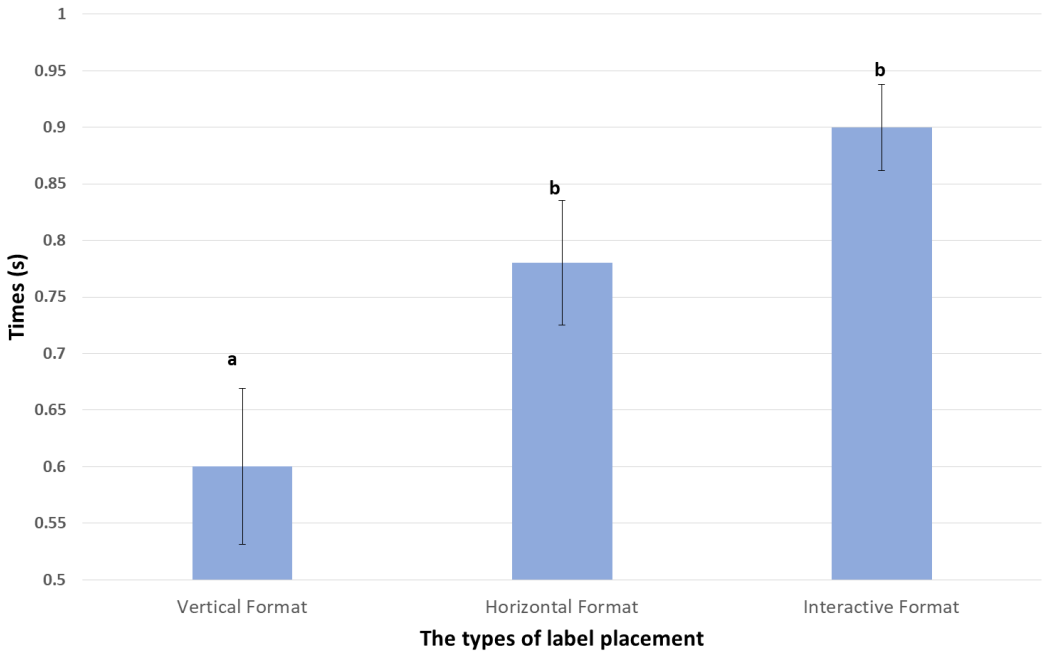

Figure 6. The result of the back-transformed least square means of probability of noticing auxiliary warning label Comparisons were conducted at alpha=0.05 (95% Confidence Interval) and differences are indicated as different superscripts (avsb)

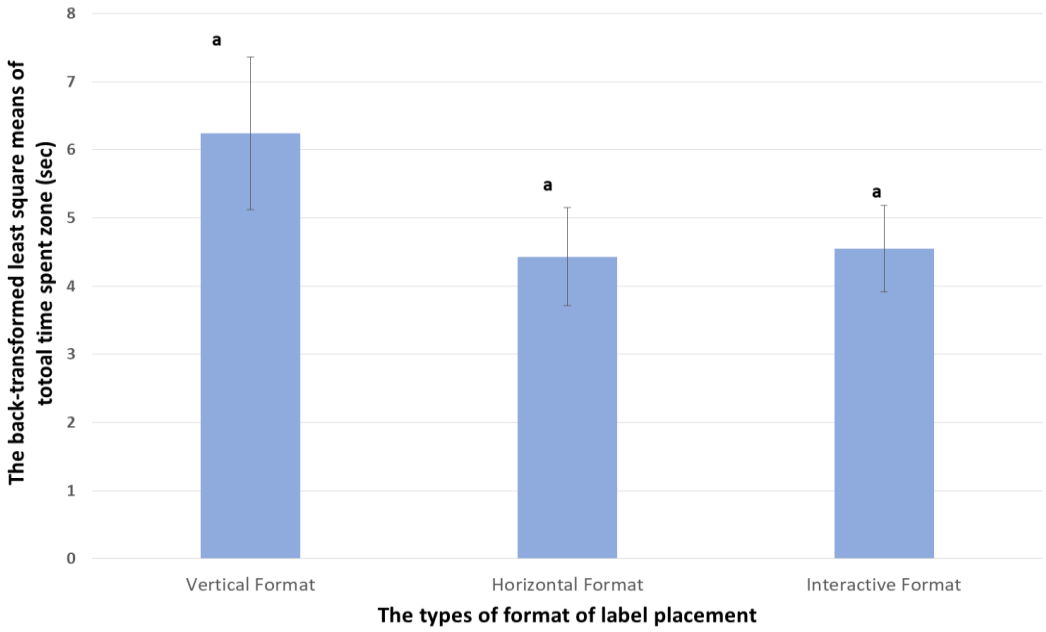

Figure 7. The result of the back-transformed least square means of time to first visual hit Comparisons were conducted at alpha=0.05 (95% Confidence Interval) and differences are indicated as different superscripts (avsb)

significant differences on the total time spent on the vertical placement when it was compared with the time spent on the horizontal placement (See Figure 5). However, analyses suggested statistically significant differences in the total time spent when the horizontal and interactive placements were compared (P<0.0001), and when the total time spent on the vertical and interactive formats were compared (P<0.0001). This suggests that subjects spent more time viewing auxiliary label information when it was placed in an interactive placement compared with the time that was spent on either of the other placements.

The probability of noticing the auxiliary warning label: yes/no (probability binary variable): Comparisons of the vertical placement and the horizontal placement (See Figure 6) suggested significant differences in the probability of information being viewed by participants based on

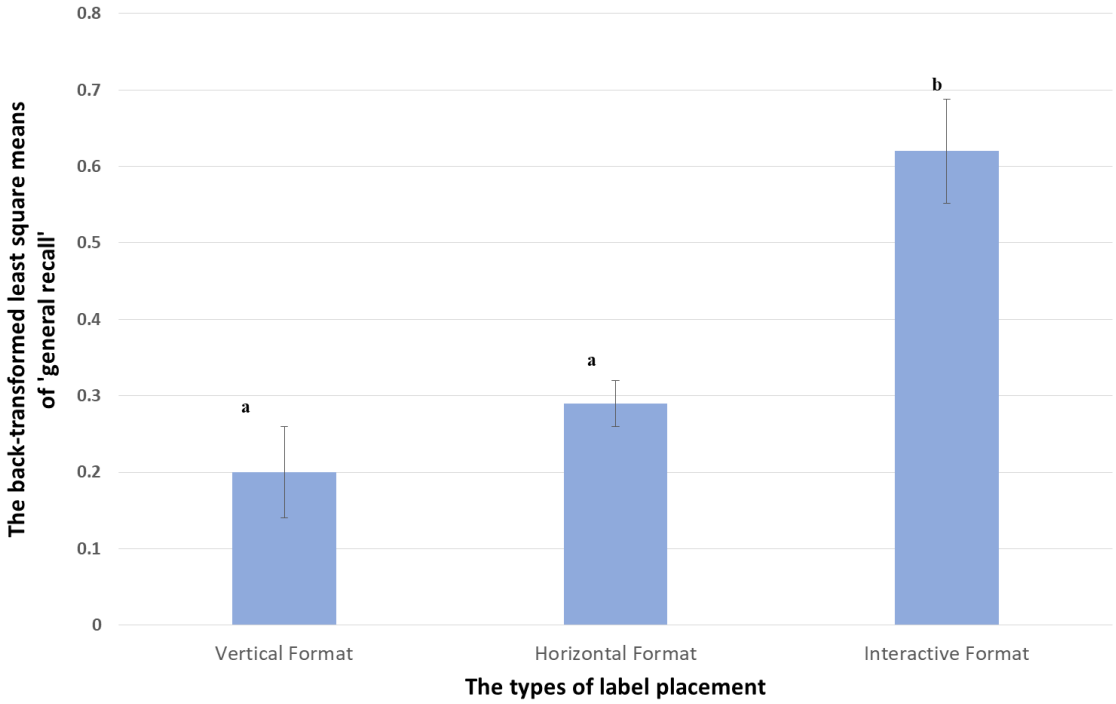

Figure 8. The result of the back-transformed least square means of recall test
Comparisons were conducted at alpha=0.05 (95% Confidence) and differences are indicated as different superscripts (avsb)

Table 5. Statistical analysis of recall and recognition test

	Vertical Placement	Horizontal Placement	Interactive Placement
Recall of Information Content **Coded as "1": recalled information related to content** **Coded as "2": did not recall information related to content**	1.82; SD 0.39[a]	1.75; SD 0.43[a]	1.52; SD 0.50[b]
Interpretation of findings related to *recall of label information*- The closer the average was to two, the less likely the information contained on the format was to be recalled; the closer the average was to one, the greater the chances of recall (at 95% confidence- indicated by the difference in letters [a] vs[b]). Participants were statistically, significantly more likely to recall information that was presented in the interactive placement than information presented in either vertical or horizontal placements. There was no evidence of a difference (at 95% confidence) in performance when recall of information placed in the horizontal and vertical formats were compared (as indicated by the presence of the same superscript ([a]vs[a]).			
Recall of Warning Placement **Coded as "1": recalled information related to warning placement** **Coded as "2": did not recall information related to warning placement**	1.91; SD 0.29[a]	1.93; SD 0.24[a]	1.83; SD 0.38[b]
Interpretation of findings related to *recall of label position*- The closer the average was to two, the less likely participants were to say something about the placement of the label in that format; the closer the average was to one, the greater the chances of recalling something about the placement of the label (at 95% confidence- indicated by the difference in letters [a] vs[b]). Participants were statistically, significantly more likely to recall labels placed across the cap (interactive) than placements that were vertical or horizontal placements. There was no evidence of a difference (at 95% confidence) in recalling that labels were horizontally or vertically placed (as indicated by the presence of the same superscript ([a]vs[a]).			
General recall evaluation (probability)	0.20±0.060[a]	0.29; SD 0.030[a]	0.62±0.068[b]
Interpretation of findings related to *general recall*- The proportion of participants that recalled EITHER the information that was contained on the label (by format) OR how the label was placed (vertical, horizontal or interactive) is compared at 95% confidence- statistically significant differences are indicated by differing letters [a] vs[b]). Participants (62%) were statistically, significantly more likely to recall something labels placed across the cap (interactive) than placements that were vertical (20%) or horizontal (29%). There was no evidence of a difference (at 95% confidence) in recalling that labels were vertically (20%) or horizontally (29%) placed (as indicated by the presence of the same superscript ([a]vs[a]).			
Recognition test **Coded as "1": correctly recognized message that had been presented** **Coded as "2": did not recognize warning that had been presented**	1.77; SD 0.58[a]	1.58; SD 0.60[b]	1.51; SD 0.59[b]
Interpretation of findings related to *recognition*- The closer the average was to two, the less likely the auxiliary label was to be correctly circled as recognized; the closer the average was to one, the greater the chances of correctly recognizing the label from the list (at 95% confidence- indicated by the difference in letters [a] vs[b]). Participants were statistically, significantly more likely to recognize labels that had been presented to them in interactive placements or horizontal placements then labels that were shown to them in vertical formats ([a] vs[b]). There was no evidence of a difference (at 95% confidence) in performance when recognition of labels placed in the horizontal and interactive formats were compared (as indicated by the presence of the same superscript ([b]vs[b]).			

***** Row pairwise comparisons were conducted at alpha =0.05

placement (P=0.038). Comparison of the vertical placement and the interactive placement, also suggested evidence of significant differences (P=0.0003). However, when the horizontal and interactive were compared, no evidence of difference was apparent (p=0.065).

The time to first hit the auxiliary warning label (continuous variable): The dependent variable, time to first hit, was analyzed for each auxiliary warning label placement using Gazetracker software.

There was no evidence of a significant effect, that is, among participants who viewed the respective treatments, no difference was evident in the time it took to notice each (See Figure 7).

Tests of recall and recognition

A summation of the analysis for all dependent variables related to both tests of free recall and recognition is presented in Table 5. Pairwise comparisons were conducted using Fisher's LSD.

Statistical analysis of the data related to free recall (See Figure 8) suggested that the subjects more frequently recalled information appearing in interactive placements than those appearing in vertical placements (p<0.0001). Likewise, subjects were more likely to recall information in the interactive placement than horizontal placements (P=0.0009). Statistical significance of difference was not evident when the horizontal placement and the vertical placements were compared.

Participants correctly recognized information that appeared in the horizontal placement more often than the information appearing in a vertical placement (p=0.0189) (See Figure 9). Further, participants recognized the warnings appearing in an interactive placement more frequently than those in vertical placements (P=0.0153). However, there was no evidence that recognition rates were influenced by whether a message appeared in the horizontal or interactive placements.

DISCUSSION

The only references we found specific to placement of auxiliary labels both come from Shiyanbola's team (6, 7). In 2014, Shiyanbola's team suggested that auxiliary labels are generally placed in a vertical placement when they state that these warnings are typically placed "adjacent" to the pharmacy label (6). Their 2016 publication makes a formal recommendation for having auxiliary labels on the front of the package because their enhanced placement provides "enhanced importance" to the patient (7). Early stage processing (attention), a prerequisite to comprehension, receives little objective investigation in the body of work which investigates auxiliary label performance.

Work presented here provides objective evidence, as mandated by USP <17>, for cases where pharmacists do choose to use auxiliary labels. Specifically, from an information processing model perspective (see Table 2), it is likely that when auxiliary labels are applied vertically, the label is predestined to fail when those that don't actively

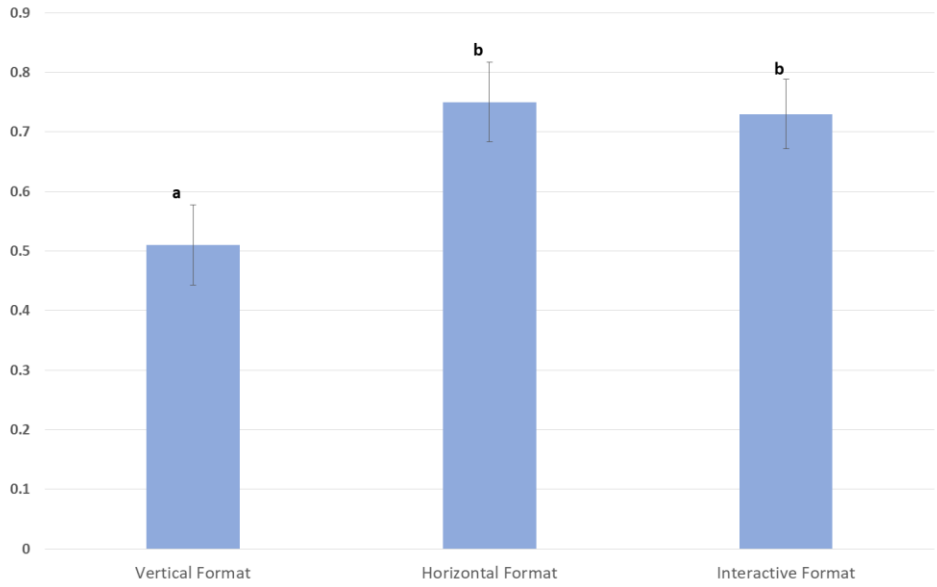

Figure 9. The result of probability from back-transformed least square of recognition test Comparisons were conducted at alpha=0.05 (95% Confidence Interval) and differences are indicated as different superscripts (avsb)

rotate the vial are never exposed to the information provided. By contrast, information that is provided in the horizontal and interactive formats are more likely to be encountered; evidence presented herein suggests that the interactive placement of auxiliary labels (specifically, across the cap) is an effective way to garner the attention of both younger and older adults.

Although the interactive format did outperform both horizontal and vertical placements in most aspects of the study, from a practical standpoint, other factors must also be considered. The structural profiles of the vials create a situation where messages are "draped" across the structure. Although our work suggests enhanced noticability of warnings placed in this format, it has the potential to interfere with later stages of processing by hindering readability of the message. Further, it is inevitable that there would be wear to labels that are applied in this fashion; as such, it is possible that the interactive format would lose functionality with time as it was handled again and again. Given that the auxiliary labels in horizontal placements frequently provided performance results similar to the interactive format, our work bolsters the recommendations of other researchers [17] who recommend that when auxiliary labels are used (as is allowed by USP<17>) they should be applied to the front of the vial.

Limitations

In order to maximize the accuracy of the tracking, participants were limited in the way that they were positioned physically. They had to interact and open vials within the space that was calibrated in order to not lose data. This is, obviously, an artificial environment. Further, participants were aware of the fact that we were viewing their eye movements as they interacted with the prescription vials that were provided; this had the potential to influence their behavior significantly. Because we focused on early stage processing (attention), we tested only brand-new labels. This failed to address real world constraints; for example, the wear of messages that would inevitably occur should an interactive format be applied.

CONCLUSIONS

To our knowledge, we are among the first to directly measure the attentive behaviors of consumers interacting with prescriptions to objectively assess the ability of auxiliary labels to garner attention.[25] Data and analysis presented herein provides evidence which can serve as an objective guide for the placement of auxiliary warning labels should pharmacists choose to employ them.

ACKNOWLEDGEMENTS

The authors would like to thank the Institute of Korea Packaging Systems for project funding. Also, the authors thank Dr. Diana Twede and Dr. Kami Silk at Michigan State University for support and advice offered for this project to be completed. The authors would also like to thank Dr. Beth Martin at the University of Wisconsin's School of Pharmacy for providing feedback regarding revisions made to the manuscript and suggestions for the same.

CONFLICT OF INTEREST

LB has served as a paid plaintiff expert in many cases involving warning labels and OTC products. LB has served as a consultant for a drug company on a project which intended to improve the physical utility of their products. LB has received reimbursement for travel expenses to present at conferences sponsored by DuPont, Q1 Productions, UBM Cannon, the US Food and Drug Administration (FDA) and the US Centers for Disease Control and Prevention (CDC).

ML works at the Climate Corporation, RPS currently works at Cardinal Health and JR currently works at Mac Valves

(formerly at Abott). All were students when assisting with relevant aspects of this project. JL is currently an intern with Edward Life Sciences; work presented herein was performed and published in partial fulfillment of her MSc thesis work.

FUNDING

Work presented was partially funded with support from the Institute of Korea Packaging Systems (00097844). A portion of LB's salary is supported by the United States Department of Agriculture National Institute of Food and Agriculture (NIFA), Hatch project (MICL02263). These funders/contributors had no role in designing the study; collecting, analyzing or interpreting the data; writing the publication or decision to submit. No agreements exist with them precluding the sharing of the data or materials.

References

1. About Medication Errors. National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) 2018. Available at: http://www.nccmerp.org/about-medication-errors (accessed Feb 3, 2019).
2. Aspden P, Wolcott J, Bootman JL, Cronenwett LR, editors. Preventing medication errors: quality chasm series Washington, DC: The National Academies Press; 2007.
3. Shrank W, Avorn J, Rolon C, Shekelle P. Medication safety: Effect of content and format of prescription drug labels on readability, understanding, and medication use: A systematic review. Ann Pharmacother. 2007;41(5):783-801. https://doi.org/10.1345/aph.1H582
4. Kebodeaux CD, Peters GL, Kindermann HA, Hurd PD, Berry TM. Patient-perceived content and formatting expectations for prescription container labeling. J Am Pharm Assoc (2003). 2016;56(3):242-247. https://doi.org/10.1016/j.japh.2016.01.007
5. Locke MR, Shiyanbola OO, Gripentrog E. Improving prescription auxiliary labels to increase patient understanding. J Am Pharm Assoc (2003). 2014;54(3):267-274. https://doi.org/10.1331/JAPhA.2014.13163
6. Shiyanbola OO, Meyer BA, Locke MR, Wettergreen S. Perceptions of prescription warning labels within an underserved population. Pharm Pract (Granada). 2014;12(1):387. https://doi.org/10.4321/s1886-36552014000100008
7. Shiyanbola OO, Smith PD, Mansukhani SG, Huang YM. Refining prescription warning labels using patient feedback: a qualitative study. PLoS One. 2016;11(6):e0156881. https://doi.org/10.1371/journal.pone.0156881
8. Webb J, Davis TC, Bernadella P, Clayman ML, Parker RM, Adler D, Wolf MS. Patient-centered approach for improving prescription drug warning labels. Patient Educ Couns. 2008;72(3):443-449. https://doi.org/10.1016/j.pec.2008.05.019
9. Jones JH, Treiber LA, Jones MC. Intervening at the intersection of medication adherence and health literacy. J Nurse Pract. 2014;10(8):527-534. https://doi.org/10.1016/j.nurpra.2014.06.014
10. Gill RT, Barbera C, Precht T, editors. A comparative evaluation of warning label designs. Proceedings of the Human Factors Society 1987 Annual Meeting. Los Angeles, CA: SAGE; 1987.
11. Davis TC, Wolf MS, Bass PF, Middlebrooks M, Kennen E, Baker DW, Bennett CL, Durazo-Arvizu R, Bocchini A, Savory S. Low literacy impairs comprehension of prescription drug warning labels. J Gen Intern Med. 2006;21(8):847-851. https://doi.org/10.1111/j.1525-1497.2006.00529.x
12. Davis TC, Wolf MS, Bass PF, Thompson JA, Tilson HH, Neuberger M, Parker RM. Literacy and misunderstanding prescription drug labels. Ann Intern Med. 2006;145(12):887-894. https://doi.org/10.7326/0003-4819-145-12-200612190-00144
13. Wolf MS, Davis TC, Bass PF, Curtis LM, Lindquist LA, Webb JA, Bocchini MV, Bailey SC, Parker RM. Improving prescription drug warnings to promote patient comprehension. Arch Intern Med. 2010;170(1):50-56. https://doi.org/10.1001/archinternmed.2009.454
14. Mullen RJ, Duhig J, Russell A, Scarazzini L, Lievano F, Wolf MS. Best-practices for the design and development of prescription medication information: A systematic review. Patient Educ Couns. 2018;101(8):1351-1367. https://doi.org/10.1016/j.pec.2018.03.012
15. Bailey SC, Navaratnam P, Black H, Russell AL, Wolf MS. Advancing best practices for prescription drug labeling. Ann Pharmacother. 2015;49(11):1222-1236. https://doi.org/10.1177/1060028015602272
16. Wali H, Hudani Z, Wali S, Mercer K, Grindrod K. A systematic review of interventions to improve medication information for low health literate populations. Res Social Adm Pharm. 2016;12(6):830-864. https://doi.org/10.1016/j.sapharm.2015.12.001
17. McEvoy G. Creating a Standard for Medication Prescription Labels. Health Literacy Past, Present and Future. Washington, DC: IOM; 2014.
18. National Association of Boards of Pharmacy. USP prescription container Labeling chapter is now the official standard: the USP 36–NF 31. Mount Prospect, IL: NABP; 2012.
19. DeJoy DM, editor A revised model of the warnings process derived from value-expectancy theory. Proceedings of the Human Factors Society 1991 Annual Meeting; Los Angeles, CA: SAGE; 1991.
20. de la Fuente J, Bix L. A tool for designing and evaluating packaging for healthcare products. J Patient Compl. 2011;1:48-52.
21. Wogalter MS, Desaulniers DR, Brelsford Jr JW, editors. Perceptions of consumer products: Hazardousness and warning expectations. Proceedings of the Human Factors Society 1986 Annual Meeting. Los Angeles, CA: SAGE; 1986.
22. Wolf MS, Davis TC, Shrank W, Rapp DN, Bass PF, Connor UM, Clayman M, Parker RM. To err is human: patient misinterpretations of prescription drug label instructions. Patient Educ Couns. 2007;67(3):293-300. https://doi.org/10.1016/j.pec.2007.03.024

23. Laughery KR, Stanush JA, editors. Effects of warning explicitness on product perceptions. Proceedings of the Human Factors Society 1989 Annual Meeting. Los Angeles, CA: SAGE; 1989.
24. Hunn BP, Dingus TA. Interactivity, information, and compliance cost in a consumer product warning scenario. Accid Anal Prev. 1992;24(5):497-505.
25. Duffy RR, Kalsher MJ, Wogalter MS. Increased effectiveness of an interactive warning in a realistic incidental product-use situation. Int J Indust Ergon. 1995;15(3):159-166.
26. Sundar RP, Becker MW, Bello NM, Bix L. Quantifying age-related differences in information processing behaviors when viewing prescription drug labels. PLoS One. 2012;7(6):e38819. https://doi.org/10.1371/journal.pone.0038819
27. Bass PF 3rd, Wilson JF, Griffith CH. A shortened instrument for literacy screening. J Gen Intern Med. 2003;18(12):1036-1038. https://doi.org/10.1111/j.1525-1497.2003.10651.x
28. Flesch R. A new readability yardstick. J Appl Psychol. 1948;32(3):221-233.
29. The Flesch Reading Ease Readability Formula. Available at: http://www.readabilityformulas.com/flesch-reading-ease-readability-formula.php (accessed Feb 3, 2019).

Original Research

Assessing hormonal contraceptive dispensing and counseling provided by community pharmacists in the United Arab Emirates: a simulated patient study

Dalal M. MOBARK, Moawia M. AL-TABAKHA, Sanah HASAN.
Received (first version): 5-Feb-2019 Accepted: 26-May-2019 Published online: 11-Jun-2019

Abstract

Background: Hormonal contraceptive pills have evolved as a common form of contraception worldwide. Pharmacists play a vital role in providing safe and effective access to these medicines. In many developing countries such as the United Arab Emirates (UAE), these medicines are available to the general public without the presentation of a prescription which requires the pharmacist to shoulder responsibility by assessing and educating patients to assure their appropriate use.

Objectives: To evaluate community pharmacists' current practice of dispensing and counseling on hormonal contraceptives

Methods: Simulated patient methodology was used in this study. A single simulated patient visited community pharmacies requesting an oral contraceptive as per a preplanned scenario. Information from the visits were recorded on a data collection form including: pharmacist assessing patient eligibility to take hormonal contraceptives, selecting the appropriate oral contraceptive, providing complete counseling on how to use the pill, adherence, missed dose handlings and side effects of the medication. The Pharmacist was prompted by the simulated patient to provide the information if they did not provide spontaneous counseling. The quality of pharmacists' counseling was rated and consequently coded as complete, incomplete or poor.

Results: A total of 201 community pharmacies were visited. More than 92% of the pharmacists did not ask the simulated patient any question to assess their eligibility to use contraceptives. Twenty three pharmacists (11.4%) selected the proper product. One hundred seventeen (58.2%) of the pharmacists provided spontaneous counseling on how to use the pill, 17 of them had their counsel rated as complete, but none of the pharmacists provided spontaneous counseling regarding adherence or side effects of the medications. On prompting, 10 pharmacists (12%) provided complete counseling regarding how to use oral contraceptives, 14 pharmacists (7.0%) provided complete counseling on adherence and missing dose handling and five pharmacists (2.5%) provided complete counseling about expected side effects.

Conclusions: Pharmacists' practice regarding hormonal contraceptive dispensing and counseling was suboptimal in this study. Areas needing intervention were related to pharmacist assessment of eligibility for oral contraceptive use, choice of optimal oral contraceptive for patient-specific co-morbidities and provision of adequate counseling regarding proper use, adherence and missed dose handlings.

Keywords

Contraceptive Agents; Contraception; Counseling; Professional Practice; Community Pharmacy Services; Pharmacies; Pharmacists; Quality of Health Care; Patient Simulation; United Arab Emirates

INTRODUCTION

In 1999, the Center for Disease Control and Prevention (CDC) considered family planning as one of the greatest achievements in public health in the 20th century.[1] Family planning allows families to attain their desired number of children and determine the spacing of pregnancies.[2] A variety of contraception methods are available; hormonal and non-hormonal. Over 100 million women worldwide are using oral hormonal contraceptive pills, a combination of the synthetic estrogens and progestin, or the progestin only pills, making "The Pill'' the most common form of contraception in western countries.[3] Oral hormonal contraceptives are above 99% effective in preventing pregnancy with perfect use, are convenient and their effect is reversible. In addition, oral contraceptives have numerous non contraceptive health benefits including improving regulation of menstruation and reducing the risk of endometrial, ovarian and colon cancers.[4] Despite the contraceptive and non-contraceptive benefits of hormonal contraceptives, surveys from around the world have reported that as many as 60% of their users report irregular use due to fear of side effects, which would result in unintended pregnancy.[5] Less common side effects of hormonal contraceptives include an increased risk of venous thromboembolism and breast cancer development.[6] Common reported side effects by users of these products include headache, mood changes, nausea and breast discomfort which mostly improve by the second or third cycle of use.[6] Studies have found that the lack of appropriate counseling regarding proper use and expected side effects of these medications is a leading cause of their incorrect use, premature discontinuation and missing dose mishandling leading to failure of the regimen and possibly increased side effects.[7]

The World Health Organization (WHO) developed the Medical Eligibility Criteria for contraceptive use a classification of risks posed when hormonal contraceptives are used.[8] Women, who smoke, are obese, who have a family history of coronary artery disease, are over 35 years

Dalal M. MOBARK. BPharm. College of Pharmacy & Health Sciences, Ajman University. Ajman (United Arab Emirates). dalal.mobarak7@gmail.com
Moawia M. AL-TABAKHA. Associate Professor. Department of Pharmaceutical Sciences, College of Pharmacy & Health Sciences, Ajman University. Ajman (United Arab Emirates). m.altabakha@ajman.ac.ae
Sanah HASAN. Assistant Professor. Department of Clinical Sciences, College of Pharmacy & Health Sciences, Ajman University. Ajman (United Arab Emirates). s.hasan@ajman.ac.ae

of age, or those with concomitant disease states, including hypertension, diabetes, hyperlipidemia and migraine, have been shown to be at significantly greater risk of side effects when compared with healthy women, Additionally, the use of certain drugs like rifampin and some antiepileptic agents can potentially compromise hormonal contraceptive efficacy, thus, a thorough patient history should be obtained when initially selecting a hormonal contraceptive for an individual patient and periodic evaluation is required thereafter.[8]

Pharmacists have a vital role in educating users of hormonal contraceptives on their appropriate use and on the importance of adherence to their regimen. This will not only increase access to these medicines in timely manner and reduce cost; it will also mitigate several risks, including side effects and drug interactions.[9] They are also well positioned as the most accessible healthcare providers for the provision of contraceptive services.[9,10] In these services, the pharmacist obtains patient's relevant medical and medication history, assesses her pregnancy status, and performs blood pressure measurement. Based on the results of these screenings, the pharmacist makes a decision to dispense the medication or refer the patient to physician for further evaluation. If a product is dispensed, the pharmacist must provide proper counseling and discuss patients' questions.[11]

Studies were cited from the United States and United Kingdom where protocols and programs are implemented for pharmacist prescribing of contraceptives; they concluded that trained community pharmacists could effectively screen women for safe use of hormonal contraceptives and select the appropriate products for them.[12,13] On the other hand, studies from developing countries concerning pharmacists' involvement in hormonal contraceptives reflected minimal assessment and suboptimal screening for the safe use of the products by the patients and inadequate provided counseling.[14-17]

In the UAE, while a prescription is not required to purchase oral contraceptive pills in Dubai and the northern emirates (i.e. Sharjah, Ajman, Umm Al Quwain, Ras Al Khaimah and Fujairah) it is required in Abu Dhabi. A search of the published literature in the UAE showed there were no published studies to evaluate the pharmacists' practice on dispensing hormonal contraceptives in the UAE. Therefore, the main aim of this study was to evaluate hormonal contraceptive practice related to dispensing and counseling provided by community pharmacists in the UAE. Simulated patient also called 'mystery shopper' methodology is a research method whereby a researcher or a lay person is trained to act according to a pre-determined scenario designed to represent a patient with a specific condition. As the health professionals do not know they are dealing with a simulated patient, they offer usual, unexceptional care to the simulated patient.[18] Simulated patient methodology has been described as the 'gold standard' of clinician performance measurement due to its advantages of driving valid and reliable outcomes that are difficult to achieve by any other method in pharmacy practice research.[19] As our goal was to evaluate community pharmacists' current practice on dispensing and counseling of patients on hormonal contraceptives it was considered that simulated patient methodology would be best to evaluate this practice in a non-biased objective manner. More specific objectives were: to evaluate pharmacists' assessment of the patients' eligibility for safe use of hormonal contraceptives by obtaining a relevant patient medical history, to evaluate pharmacists' dispensing decision of selecting the proper product for the patient condition, and to evaluate pharmacists' counseling regarding how to use the medication, adherence and expected side effects issues. To our knowledge, this was the first study to use the simulated patient methodology to evaluate hormonal contraceptive dispensing practices and counseling by community pharmacists in the UAE.

METHODS

Study design and setting

Community pharmacies in the UAE were visited by a single simulated patient who was the master's student between March and May 2018. The pharmacist in charge / manager was contacted by one researcher a few weeks before the visit and informed him/her that a simulated patient would visit their pharmacy in the following weeks. They were informed about the purpose of the study but without disclosing the time of the visit, and then their verbal consent was obtained. Independent and franchised chain pharmacies were included in the study. In the UAE, the law mandates that a licensed pharmacist be on the premises whenever the pharmacy is open, assistant pharmacists and trainee pharmacists work behind the counter as well, but as per regulation this should be only under a licensed pharmacist supervision, however, to insure that only pharmacists were included in this study, the simulated patient requested to speak to the pharmacist particularly.[20] In Abu Dhabi the simulated patient presented the pharmacist with a prescription of progesterone-only pill, which was the product of choice to be recommended for the pre-determined scenario. Consenting pharmacies were visited by the researcher simulated patient to meet one pharmacist from each pharmacy and posed as a simulated patient acting according to a standardized scenario. As a prescription was needed in Abu Dhabi, it was obtained from a gynecologist practicing in the emirate for the purpose of our research. The physician was not reimbursed for this. So that Abu Dhabi was not excluded from the study, it was best seen to obtain the prescription and present it to the community pharmacist so assessment of the pharmacist handling of the encounter was carried out. Comparisons were conducted between the outcomes of encounters when the pharmacists were and were not presented with a prescription.

To minimize potential biases associated with missing information (both omissions and distortions), the simulated patient immediately recorded the data after she exited the pharmacy using a standard checklist (data collection form). Audio recording was not sought in this study as the pharmacists in charge/manager did not approve this, which could have jeopardized response.

The Scenario

In preparation for the visits, the simulated patient had a two - hour training session by one of the research team

members who had experience in this type of research methodology. The training included role play between the investigator and the simulated patient. Guidance on how to interpret and document data after the encounter with the pharmacist was also provided to the simulated patient.

This scenario involved a 30 year old woman who presented to the community pharmacists with a request: "I need a contraceptive pill, can you recommend one, please?" The woman, who was otherwise healthy, had a history of migraine with aura that was diagnosed since years (Online Appendix 1: Simulated Patient Scenario). Migraine with aura is common in women at a fertile age and is considered category 4 in the WHO Medical Eligibility Criteria for combined hormonal contraceptive (CHC) use due to its unacceptable health risk and hence, they should not be used.[8] Progestin only containing products (POP) are considered a safe alternative for CHC in these patients.[21] The pharmacist was expected to obtain patient's medical history by asking the relevant questions and recommends a POP to the simulated patient and then counsels her regarding how to use the pills, the importance of adherence and missing dose or late dose handlings followed by proper counseling regarding common side effects. This scenario was standardized for all the visits, with the simulated patient being instructed not to give additional information other than what the pharmacist asked for, and not to lead the pharmacist into asking questions. If the pharmacist failed to ask the appropriate questions or provide the desired information, the simulated patient would then prompt the pharmacist by asking for the information, details of the scenario are available in Online Appendix 1: Simulated Patient Scenario.

Pilot Study

A small pilot study consisting of 10 pharmacy visits was conducted to assess the feasibility of the study. No amendments were done to the scenario as the pilot study did not reveal any need for scenario modification. The pilot sites were excluded from further visits, and results of the pilot study were not included in final data analysis.

Data Coding

The quality of information provided by the pharmacist to the simulated patient (whether spontaneous or prompted) on all items related to provision of counseling was rated based on a coding scheme: Complete=3, Incomplete=2, Poor or incorrect information provided by the pharmacist=1.

The members of the research team held several meetings after data collection to agree on what constituted a code considering the NHS contraception guide on POP (Online Appendix 2), so the coding was consistent and reliable.[22]

Sampling

This was an observational study where representativeness is more important than large sample size; stratified convenient sampling technique was used to ensure representativeness. The local business directory, the yellow pages, was used to obtain the contact details and locations of community pharmacies in the UAE. Community pharmacies were stratified by emirate, then pharmacies from each emirate (stratum) were conveniently sampled and contacted to obtain consent to participate in the study. The total number of community pharmacies in the UAE is 2000 according to a 2010 estimate.[23] One tenth the number of pharmacies were visited: Abu Dhabi 42 (20.9%), Dubai 46 (22.9%), Sharjah 63 (31.3%), Ajman 15 (7.5%), Umm Al Quwain 12 (6%), Ras Al Khima 9 (4.5%) and Fujairah 14 (7%), to give 201 pharmacies located in the seven emirates.

Reference of Assessment

Items on the data collection form (Online Appendix 3) were derived from the "Standard Procedures Algorithm for Oregon RPh Prescribing of Contraceptives" and other studies looking at hormonal contraceptive dispensing practices.[11,14,24,25] As per the procedures algorithm, the pharmacist was expected to obtain the patient's medical history, pregnancy status, medication use, and blood pressure reading prior to dispensing the hormonal contraceptive, based on the results of these screenings, if the pharmacist decides to dispense the product, then they counsel the patient regarding proper use of the pills and on adherence and expected side effects.

Assessing: pharmacist assessment of the simulated patient's eligibility for safe use of hormonal contraceptives:

1- Obtaining patient's medical history regarding: age, smoking status, regularity of the menstrual cycle, presence of abnormal vaginal bleeding or chronic diseases such as diabetes. They also needed to rule out contraindicating conditions such as migraine with aura, uncontrolled hypertension, thromboembolic disorders, coronary heart disease, liver disease and breast cancer.

2- Screening for pregnancy status: to exclude pregnancy (e.g. a recently-performed negative urine pregnancy test, recent delivery, miscarriage or breast feeding, date of last menstruation).

3- Screening for medication and supplement use: To exclude significant drug-drug interactions with medications such as antibiotics e.g. rifambicin and anticonvulsants e.g. carbamazepine, phenytoin and phenobarbital.

Managing: Making a dispensing decision by selecting the progestin only contraceptive as the simulated patient has a condition of migraine with aura.

Counseling: The pharmacist should provide counseling on:

1- How to use the pill, when to use the pill and whether or not to take it with food. The pharmacist should explain according to the stage of menstruation cycle when the pill should be initiated; if there is a need for the use of an extra contraception until the pill becomes effective.

2- The importance of adherence and what to do in the case of a missed dose. The pharmacist should explain that a pill that is more than 12 hours late is considered a missed dose and the user should use extra contraception for the next two days.

3- The pharmacist should mention common side effects, like irregular vaginal bleeding (spotting) so the user can take sensible precautions.

Table 1. Quality of pharmacists' counseling -prompted

Item	Poor	Incomplete	Complete	Total
Quality of pharmacists' counseling on how to use the pill	34(40.4%)	40(47.6%)	10(12.0%)	84 (41.7%)
Quality of pharmacists' counseling about adherence and missing doses	95(47.3%)	92(45.8)	14(7%)	201 (100%)
Quality of pharmacists' counseling about side effects	126 (62.7%)	70 (34.8%)	5(2.5%)	201 (100%)

Data Analysis

Data were analyzed using the SPSS version 19 (Chicago, IL). Duration of simulated patient encounter in each pharmacy visited was the only continuous variable collected. To these data normality of distribution was tested using the values of mean, mode, median, skewness and kurtosis. Descriptive analysis was employed for normally distributed data. Additionally, inferential analysis was performed by calculating the duration 95% confidence interval to compare between Abu Dhabi pharmacies encounters and other emirates. Other variables in this study (e.g. characteristics of pharmacists) were categorical and therefore chi-square or Fisher's exact test were employed depending on the results' frequencies. Significant differences were based on two-tailed testing with $p<0.05$.

Ethical Considerations

Approval to conduct this research was sought from the Research Ethics Committee at Ajman University. Reference No: F-H-18-02-03.

RESULTS

Of the 235 pharmacies contacted, 201 community pharmacies agreed to participate in this study and were later visited by the simulated patient. None of the simulated patient visits were excluded.

Among the participating pharmacists, 60% (n=121) were females. More than half of the pharmacies (56%) were located in the northern emirates, while 20.9% were in Abu Dhabi and 23% in Dubai. The majority (64%) were chain pharmacies. The number of staff on duty during the visits was one pharmacist in 25% of the pharmacies (n=50), two pharmacists in 55% of the pharmacies (n=110) and three or more in 20% of the pharmacies (n=41).

More than 92 % (n=185) of the pharmacists did not ask the simulated patient any questions upon her request for an oral contraceptive. Only a few questions (1 to 3) were asked by a small number of pharmacists: seven pharmacists asked the simulated patient about possible pregnancy, six pharmacists asked about regular menstruation, two pharmacists asked about the presence of chronic illnesses and one pharmacist asked about medications or supplements used currently by the simulated patient. Female pharmacists were more likely to ask question, Fisher's exact two tailed test was used and revealed a p=0.0095.

In this study 65 pharmacists (32%) dispensed POP for the simulated patient, however, 42 of those pharmacists were in Abu Dhabi where a prescription was provided to the pharmacists as it was required by the health authority in that emirate; so actually only twenty three pharmacists (11.4%) made the correct dispensing decision and selected POP for the simulated patient, five of them were from Dubai and 18 were from the northern emirates. Without considering pharmacies in Abu Dhabi, a correct dispensing decision was not significantly different between chain and independent pharmacies using Fisher's exact test (p=0.5552).

One hundred and seventeen pharmacists (58%) provided spontaneous counseling on the use of the oral contraceptives, 17 of which were rated as complete, 71 were rated as incomplete and 29 as poor. None of the pharmacists provided spontaneous counseling on the importance of adherence or missing dose handlings or side effects of the medications.

On prompting, the quality of the pharmacists' counseling on the three aspects: how to use the pills, adherence and missing dose handling and side effects was as follows: 12% of the pharmacists provided complete counseling on the proper use of the pills, only 7% of the pharmacists provided complete counseling and education regarding adherence and action plan for missing doses, and around 3% of the pharmacists provided complete counseling on the expected side effects. These included mood swings (36%), weight gain (23%), acne (18%), depression (9%), headache (8.5%) and irregular bleeding (1%). Some pharmacists (4.5%) stated there were not any side effects caused by these medications. Table 1 shows more details on the quality of pharmacists' counseling.

Results of the bivariate analysis showed independent relationship of encounter duration and counseling on how to use the medication, medication adherence and missing dose handling (p values ranged from 0.1220 to 0.3685). Table 2 shows more details. There was no significant association between pharmacist counseling (how to use the pill, adherence and missing dose handling and side effects) and the different characteristics of the community pharmacies/ pharmacists. The mean duration of the visit was six minutes, with a range of 3 -10 minutes. The time spent showed to be normally distributed for all visited pharmacies. Because visits to Abu Dhabi pharmacies provided the pharmacists with prescription, less time was expected to be spent in the pharmacies. In fact significant differences in the durations were observed between Abu Dhabi pharmacy visits (4.6; SD 0.5 min) and the rest of emirates (6.3; SD 0.3 min).

Table 2. The independent relation between the duration of encounters > 6 minutes or ≤ 6 minutes and community pharmacists' complete counseling.

Pharmacist Practice	Significance of the Duration of Encounter
Overall counseling	Fisher's exact test p=0.1526
Counseling on how to use the pills	Chi-square- p=0.2339
Counseling on adherence	Chi-square p=0.1220
Counseling on side effect	Fisher's exact test p=0.3685

DISCUSSION

This study revealed that there is substantial room for improving pharmacist dispensing and counseling regarding oral contraceptive use among female users in the UAE. The findings will help to recognize areas needing intervention and further development. In Abu Dhabi a prescription was provided to the pharmacists as it was required by regulation; unfortunately, pharmacists dispensed the prescription without much patient questioning. Overall none of the pharmacists conducted a systematic medical or medication history checking, which could present unacceptable health risks to the patient.

Our findings were comparable to findings in a study from Brazil that also used simulated patient methodology where more than 90% of the participating pharmacists did not ask the simulated patient any questions before dispensing the oral contraceptives, a few pharmacists provided counseling when dispensing the medications, which was rated as poor by the evaluators.[14] In a study from Iran using the same methodology, about 41.43% pharmacists did not ask the simulated patient any questions, and none of the pharmacists asked questions about blood pressure or medication history of the patient before dispensing, more than 40% of the pharmacists did not provide any counseling, and overall the counseling quality was rated as poor.[17] Also, cross sectional studies from Mexico and Thailand, found that a significant proportion of pharmacists did not ask any questions to women before dispensing oral contraceptives.[15,16] The limited evidences from developing countries concerning pharmacists' involvement in hormonal contraceptives reflected infrequent collection of patient medical history and limited engagement in patient counseling.[14-17]

In our study, even when the simulated patient indicated to the pharmacists that she suffers from migraine with aura, most pharmacists were oblivious that combined hormonal contraceptives were contraindicated in women with migraine due to the estrogen content. In a meta-analysis it was suggested that women with migraine have an increased risk of hemorrhagic stroke when using CHC.[26] Another study has shown that the likelihood of developing an ischemic stroke in combined hormonal contraceptives users with a history of migraine was approximately eight fold higher than that in women without migraine.[27] Most pharmacists failed to recognize and discuss this condition-drug interaction thus failed to make the correct dispensing decision to select POP to the simulated patient. In agreement with our results, studies from Iran and Brazil showed that most of the pharmacists failed to discuss drug interactions with the patient when they asked for oral contraceptives.[14,17]

When it came to assessing patient counseling by the pharmacists, it was found that more than half of the pharmacists provided spontaneous counseling to the simulated patient regarding how to use POP, however, the simulated patient had to prompt all the participating pharmacists for information regarding counseling on adherence, missing dose action plan and expected side effects.

The overall quality of the counseling was poor. Studies have well established that a thorough patient counseling on hormonal contraceptives regarding how to take the pills, steps to be taken when missing a pill or more, the use of backup methods, and the expected adverse effects, are important to achieve desired outcomes, improve adherence to the pills, and enhance safety and patient satisfaction with pharmacists' services.[28] Provision of information about side effects is specifically associated with improved outcomes.[28] For instance when the pharmacist counsel the user about the manageable side effects such as headache, mood changes, nausea, breast discomfort and irregular bleeding, the user can use sensible precautions when possible and better cope with them and eventually improve adherance.[6]

Our findings can be attributed to several factors; the culture has an impact when it comes to this matter as contraception is considered a sensitive and a private subject especially when a male pharmacist is serving a female patient. In this study, it was noticeable that mostly female pharmacists attempted to obtain the medical history of the simulated patient by asking a question about pregnancy status and regular menstruation, this finding was also reported in a related study.[17] Moreover, the lack of privacy induced by the absence of designated consultation areas in most of the pharmacies might have hindered proper pharmacist-patient interaction, in a study by Hasan, participants highlighted the need for a private room for counseling as community pharmacies in the UAE lack these facilities.[29] Studies from neighboring countries have also reported similar findings; 50% of respondents stated that the lack of privacy in the pharmacy was a barrier to seeking the community pharmacist's help.[30] Another factor is related to work force as community pharmacies in the UAE employing on average 2.6 full-time-equivalent (FTE) pharmacists 74% employing around three-quarters of the pharmacies dispensed fewer than 100 prescriptions and responded to fewer than 100 requests for over-the-counter medicines per day.[29] World Health Organization core health indicators (2002) estimated the number of pharmacists per 10000 population in the UAE is to be four pharmacists,[31] Another study demonstrated that there were workforce-related conditions resulting generally in shortcomings in the quality of community pharmacy services in the UAE.[32]

Other possible reasons for our findings could be inadequate training of pharmacists concerning this issue, unlike it is in some developed countries. For example, in the USA the Accreditation Council for Pharmacy Education (ACPE) mandates that the pharmacy colleges must ensure that graduates are competent to provide patient-centered care with proper assessment and counseling.[10] In the USA, Gardner et al. found that trained community pharmacists can efficiently screen women for safe use of hormonal contraceptives and select appropriate products. Both the women seeking contraceptives and the pharmacists were satisfied with the service, and women were willing to pay for them.[12] Pharmacists who wish to participate in these practices must first complete the necessary training seminars mandated by their state and work under Collaborative Prescribing Protocol.[12] Studies from the UK aimed to evaluate community pharmacists delivering oral

contraception service concluded that trained pharmacists under Patient Group Direction Protocol (PGD) were clinically competent to provide oral contraceptives in the community settings and served users were largely satisfied and had valued the service highly, in particular, the convenience, anonymity, drop-in system, long opening hours and lack of waiting time.[13,33] In the UK for pharmacists to provide contraception service, they have to complete an MSc module on oral hormonal contraceptive services and work through the PGD. In the UAE there are no protocols recommended by pharmaceutical authorities or other organizations that mandate community pharmacists to screen for the safe use of hormonal contraceptives, and counseling women regarding their correct use. In the UAE, the local regulatory bodies require an internship for the purposes of obtaining a license to practice pharmacy, however, these programs need improvements to be more structured and have specific learning objectives that include hormonal contraceptive services. Many steps could be taken to improve hormonal contraceptive practice in the UAE such as utilizing the successful international models and implementing protocols and tools like patient assessment checklists and the use of patient information leaflets.

Study limitations

In this study, only one simulated patient carried out all visits to the pharmacies, the use of a single simulated patient is strength in this study in terms of consistency, standardizing the approach and eliminating inter-rater variability.[34] The lack of audio recording could be a limitation as the simulated patient depended on memory to document the interaction with the pharmacist; however, to overcome this limitation, the simulated patient recorded the details of the visit immediately after exiting the pharmacy. The subjectivity in the simulated patient evaluation of the counseling by the pharmacist is inherently there, however, to minimize possible biases in simulated patient's evaluation, the simulated patient received rigorous training and the research team agreed on how to rate the counseling and on what constituted a code as complete, incomplete or poor.

CONCLUSIONS

Pharmacists' practices regarding oral contraceptive dispensing and counseling were suboptimal in the study. Pharmacists failed to assess the simulated patient for the safe use of oral contraceptive with inconsistent collection of patient history, improper selection of the product for the simulated patient's condition and the poor quality of information given to the simulated patient. Efforts are needed to improve hormonal contraceptive dispensing practices in community pharmacies in the UAE to promote their rational and effective use. Improving pharmacist's patient - centered role by means of training and education, and designing guidelines in regards to the dispensing and use of hormonal contraceptives are essential. Future research could look at the kind of interventions specifically designed to improve this practice.

ACKNOWLEDGEMENTS

The authors would like to thank the community pharmacies who agreed to participate in this project.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

FUNDING

The authors did not seek funding for this research.

References

1. Achievements in Public Health, 1900-1999: Family Planning. Available at: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm4847a1.htm (accessed Feb 5, 2019).
2. WHO | Family planning/Contraception. Available at: http://www.who.int/mediacentre/factsheets/fs351/en/ (accessed Feb 5, 2019).
3. Family Planning - Model - United Nations Population Division | Department of Economic and Social Affairs. Available at: http://www.un.org/en/development/desa/population/theme/family-planning/cp_model.shtml (accessed Feb 5, 2019).
4. Schindler AE. Non-contraceptive benefits of oral hormonal contraceptives. Int J Endocrinol Metab. 2013;11(1):41-47. https://doi.org/10.5812/ijem.4158
5. Brynhildsen J. Combined hormonal contraceptives: prescribing patterns, compliance, and benefits versus risks. Ther Adv Drug Saf. 2014;5(5):201-213. https://doi.org/10.1177/2042098614548857
6. Wolski H. [Selected aspects of oral contraception side effects]. Ginekol Pol. 2014;85(12):944-999.
7. Sonfield A, Kost K, Gold RB, Finer LB. The public costs of births resulting from unintended pregnancies: national and state-level estimates. Perspect Sex Reprod Health. 2011;43(2):94-102. https://doi.org/10.1363/4309411
8. World Health Organization. Reproductive Health and Research, World Health Organization. Medical eligibility criteria for contraceptive use. Geneva: WHO; 2015.
9. Peter LM, DiPietro NA. Pharmacists' Provision of Contraception: Established and Emerging Roles. Innov Pharm. 2016;7(3):15.
10. McIntosh J, Rafie S, Wasik M, McBane S, Lodise NM, El-Ibiary SY, Forinash A, Kachlic MD, Rowe E, Besinque K. Changing oral contraceptives from prescription to over-the-counter status: an opinion statement of the Women's Health Practice and Research Network of the American College of Clinical Pharmacy. Pharmacotherapy. 2011;31(4):424-437. https://doi.org/10.1592/phco.31.4.424
11. How Oregon Pharmacists Are Prescribing Birth Control [Internet]. Available at: http://www.pharmacytimes.com/resource-centers/womens-health/how-oregon-pharmacists-are-prescribing-birth-control (accessed Feb 5, 2019).

12. Gardner JS, Miller L, Downing DF, Le S, Blough D, Shotorbani S. Pharmacist prescribing of hormonal contraceptives: results of the Direct Access study. J Am Pharm Assoc (2003). 2008;48(2):212-221. https://doi.org/10.1331/JAPhA.2008.07138
13. NHS. Evaluation of Oral Contraception in Community Pharmacy Pilot in Southwark and Lambeth. Available at: http://ocsotc.org/wp-content/uploads/2012/04/NHS-2012_Evaluation-of-pharmacy-provision-of-OCs-in-London-1-2012.pdf (accessed Feb 5, 2019).
14. Obreli-Neto PR, Pereira LRL, Guidoni CM, de Oliveira Baldoni A, Marusic S, de Lyra-Júnior DP, de Almeida KL, Pazete AC, do Nascimento JD, Kos M, Girotto E, Cuman RK. Use of simulated patients to evaluate combined oral contraceptive dispensing practices of community pharmacists. PLoS One. 2013;8(12):e79875. https://doi.org/10.1371/journal.pone.0079875
15. Ratanajamit C, Chongsuvivatwong V. Survey of knowledge and practice on oral contraceptive and emergency contraceptive pills of drugstore personnel in Hat Yai, Thailand. Pharmacoepidemiol Drug Saf. 2001;10(2):149-156. https://doi.org/10.1002/pds.573
16. Becker D, Garcia SG, Ellertson C. Do Mexico City pharmacy workers screen women for health risks when they sell oral contraceptive pills over-the-counter? Contraception. 2004;69(4):295-299. https://doi.org/10.1016/j.contraception.2003.11.014
17. Foroutan N, Dabaghzadeh F. Evaluating the practice of Iranian community pharmacists regarding oral contraceptive pills using simulated patients. Pharm Pract (Granada). 2016;14(4):745. https://doi.org/10.18549/PharmPract.2016.04.745
18. Cleland JA, Abe K, Rethans JJ. The use of simulated patients in medical education: AMEE Guide No 42. Med Teach. 2009;31(6):477-486.
19. Weiner SJ, Schwartz A. Directly Observed Care: Can Unannounced Standardized Patients Address a Gap in Performance Measurement? J Gen Intern Med. 2014;29(8):1183-1187. https://doi.org/10.1007/s11606-014-2860-7
20. Dubai Community Pharmacy Licensure and Pharmaceutical Practices Guide. Available at: https://www.dha.gov.ae/Documents/Regulations/Dubai%20Community%20Pharmacy%20Licensure%20and%20Pharmaceutical%20Practices%20Guide.pdf (accessed Feb 5, 2019).
21. Nappi RE, Merki-Feld GS, Terreno E, Pellegrinelli A, Viana M. Hormonal contraception in women with migraine: is progestogen-only contraception a better choice? J Headache Pain. 2013;14:66. https://doi.org/10.1186/1129-2377-14-66
22. The progestogen-only pill - NHS.UK. Available at: https://www.nhs.uk/conditions/contraception/the-pill-progestogen-only/ (accessed Feb 5, 2019).
23. UAE has over 2000 private pharmacies, 4000 professionals. Available at: http://wam.ae/en/details/1395228626943 (accessed Feb 5, 2019).
24. Standard Procedures Algorithm For RPH Prescribing Of Hormonal Contraceptives. Available at: https://www.oregon.gov/pharmacy/Imports/ContraceptivePrescribing/ORStandardProceduresAlgorithmForRPHPrescribingOfHormonalContraceptives11_2015.pdf (accessed Feb 5, 2019).
25. Rodriguez MI, McConnell KJ, Swartz J, Edelman AB. Pharmacists prescription of hormonal contraception in Oregon: Baseline knowledge and interest in provision. J Am Pharm Assoc (2003). 2016;56(5):521-526. https://doi.org/10.1016/j.japh.2016.05.003
26. Sacco S, Ornello R, Ripa P, Pistoia F, Carolei A. Migraine and hemorrhagic stroke: a meta-analysis. Stroke. 2013;44(11):3032-3038. https://doi.org/10.1161/STROKEAHA.113.002465
27. Etminan M, Takkouche B, Isorna FC, Samii A. Risk of ischaemic stroke in people with migraine: systematic review and meta-analysis of observational studies. BMJ. 2005;330(7482):63. https://doi.org/10.1136/bmj.38302.504063.8F
28. Dehlendorf C, Krajewski C, Borrero S. Contraceptive counseling: best practices to ensure quality communication and enable effective contraceptive use. Clin Obstet Gynecol. 2014;57(4):659-673. https://doi.org/10.1097/GRF.0000000000000059
29. Hasan S, Sulieman H, Chapman C, Stewart K, Kong DC. Community pharmacy in the United Arab Emirates: characteristics and workforce issues. Int J Pharm Pract. 2011;19(6):392-399. https://doi.org/10.1111/j.2042-7174.2011.00134.x
30. El Hajj MS, Hammad AS, Afifi HM. Pharmacy students' attitudes toward pharmaceutical care in Qatar. Ther Clin Risk Manag. 2014;10:121-129. https://doi.org/10.2147/TCRM.S56982
31. WHO. United Arab Emirates. Available at: http://www.who.int/countries/are/en/ (accessed Feb 5, 2019).
32. Hasan S, Sulieman H, Chapman CB, Stewart K, Kong DC. Community pharmacy services in the United Arab Emirates. Int J Pharm Pract. 2012;20(4):218-225. https://doi.org/10.1111/j.2042-7174.2011.00182.x
33. Parsons J, Adams C, Aziz N, Holmes J, Jawad R, Whittlesea C. Evaluation of a community pharmacy delivered oral contraception service. J Fam Plann Reprod Health Care. 2013;39(2):97-101. https://doi.org/10.1136/jfprhc-2012-100304
34. Watson MC, Norris P, Granas AG. A systematic review of the use of simulated patients and pharmacy practice research. Int J Pharm Pract. 2006;14(2):83-93. https://doi.org/10.1211/ijpp.14.2.0002

https://doi.org/10.18549/PharmPract.2019.2.1470

Original Research

Availability and rationality of fixed dose combinations available in Kaduna, Nigeria

Fatima AUWAL, Mohammed N. DAHIRU, Samirah N. ABDU-AGUYE.
Received (first version): 5-Feb-2019 Accepted: 26-May-2019 Published online: 10-Jun-2019

Abstract

Background: Fixed-dose drug combinations (FDCs), are combinations of two or more active drugs in a single dosage form. Despite the advantages obtained from the use of these agents, there is increasing evidence questioning the rationality of several FDCs found in pharmaceutical markets-especially those in developing countries like Nigeria.

Objectives: To describe the availability of FDCs in drug retailing outlets located in Kaduna Nigeria, and to assess FDC registration status and inclusion on national and international essential medicines lists (EMLs). Rationality of selected FDCs was also assessed.

Methods: A cross-sectional survey was carried out from June to September 2018 in 60 registered pharmacies and patent medicine shops selected through multi-stage sampling. A data collection form was used to obtain information on the generic names and strengths of the active ingredients of the FDCs, their country of manufacture and evidence of registration with the Nigerian drug regulatory agency. To assess rationality, a scoring rubric developed from earlier studies was used. Data collected was coded and entered into a Microsoft excel 2016 spreadsheet for analysis. Descriptive statistics (frequencies and percentages) were used to report the data collected.

Results: FDCs encountered included 74 oral tablets/capsules, 52 oral liquids and 23 topical semi solids. Majority of the available FDCs were registered by Nigerian drug regulatory agency (91.5%), although only 8.5% and 6.5% in total were included on the Nigerian EML and the WHO model list respectively. Of the 99 FDCs assessed for rationality, 58 (58.6%) were found to be rational. Irrational FDCs included drugs acting on the respiratory tract (29.3%), analgesics (26.8%) and anti-infectives (22%).

Conclusions: A wide variety of FDCs were available in the study area, even though not all of them were rational. There is an urgent need for policy makers within the country to develop better detailed guidelines for FDC registration.

Keywords

Drug Combinations; Drug Therapy, Combination; Medication Adherence; Developing Countries; Nigeria

INTRODUCTION

Fixed-dose drug combinations (FDCs), are combinations of two or more active drugs in a single dosage form.[1] Several FDCs currently exist, but some of the more common combinations available include antibiotics, analgesics, antihypertensives, antidiabetics and drugs acting on the respiratory tract.[2-4] The use of these drugs may offer several benefits to patients including reduced cost of treatment, and improved health outcomes from pharmacotherapy.[5-7] Since many patients with chronic diseases like hypertension and diabetes will often require pharmacotherapy with multiple agents.[6] For these patients, FDCs have the potential to simplify treatment regimens, increase adherence and improve patient outcomes.[6-7] Furthermore-when used to treat infectious diseases, FDCs can increase the efficacy of drug treatment by broadening spectrum of activity.[8]

FDC use is also associated with several problems.[1,8] Some of these disadvantages include difficulty with dosage alterations-as the dose of one drug cannot be altered without changing the dose of the other. Other potential problems can be caused by the different pharmacokinetics of the constituent drugs, increasing the chances of unfavorable drug interactions & adverse drug effects. For antibiotic FDCs especially, the use of one or more broad spectrum antibiotics in combination can also cause serious problems for patients' e.g. antibiotic associated diarrhea and increased risk of developing resistance to one or more antibiotics.[8]

One of the major issues with FDCs is the issue of rationality.[1,9] For an FDC to be considered rational, the drugs in the combination should act by different mechanisms and not have increased toxicity when combined. In addition, their pharmacokinetics must not be widely different.[1] Several studies from parts of Asia and Latin America have shown that many FDCs are not rational, and the government of some countries have banned several FDCs.[2,4,9-11] FDC combinations so far been found to be problematic include several containing antibiotics, cough and cold medicines, antidepressants, Non-Steroidal Anti-inflammatory Drugs and antipsychotics.[10-14]

There is currently no published data on FDC availability and rationality in Nigeria. Therefore, this study was designed to describe the availability and assess the rationality of selected FDCs available in drug retailing outlets in Kaduna state, Nigeria. In addition, FDC inclusion on the 6th edition of the Nigerian essential medicines list and the 20th edition of the World Health Organization (WHO) model list of essential medicines were also assessed.[15,16]

Fatima Auwal IDRIS, Department of Clinical Pharmacy & Pharmacy Practice, Ahmadu Bello University. Zaria (Nigeria). fatyauwal03@gmail.com
Mohammed Nuruddeen DAHIRU, Department of Clinical Pharmacy & Pharmacy Practice, Ahmadu Bello University. Zaria (Nigeria). urihadmdd@gmail.com
Samirah Nndwan ABDU-AGUYE, Department of Clinical Pharmacy & Pharmacy Practice, Ahmadu Bello University. Zaria (Nigeria). sn.abduaguye@gmail.com

METHODS

Ethical Considerations

Ethical approval was obtained from the human research ethics committee of Ahmadu Bello University; (Approval number: ABUCUHSR/2018/UG/008). No information that could be used to identify the visited premises was collected, and the study did not involve any patient contact.

Study Sites

The study was carried out in Kaduna state-the fourth largest state-by land mass- in Nigeria. The state has 23 local government areas and a population of over six million inhabitants-according to 2006 official census figures.[17] The state contains three major urban areas: Kaduna metropolis, Kafanchan and Zaria.[18] Because over 95% of all the registered pharmacies in the state are located within two of these areas-Kaduna metropolis and Zaria, this study was carried out in those areas.[19]

There are two types of retail drug outlets within Nigeria-community pharmacies and patent medicine stores. Community pharmacies are run by pharmacists, while patent medicine stores are operated by Patent and Proprietary Medicine Vendors (PPMVs). PPMVs are individuals without formal training in pharmacy who are allowed by law to sell pharmaceutical products/medicines.[20] They were initially established by the Nigerian government, to improve access to medicines in communities with limited access to essential health commodities. However they now co-exist with, and are suspected to even outnumber registered community pharmacies within the country.[20] This study was carried out in both types of outlets.

Study design and sampling method

A cross-sectional survey was carried out from June to September 2018 in selected pharmacies and patent medicine stores.

Multi-stage sampling was used to select pharmacies and patent medicine stores to be visited. Given the large size of Kaduna metropolis, it was divided into two major areas-Kaduna north and Kaduna south. These two areas plus Zaria town were then subdivided into ten major suburbs each, making a total of 30 suburbs. Registered pharmacy premises in the state were then classified based on their locations into one of these 30 suburbs. One pharmacy premise was then randomly sampled from each group-making a total of 30 pharmacies. There is currently no similar list of registered patent medicine shops in the state, so convenience sampling was also used to select one patent medicine store from each suburb-also making 30 patent medicine stores. All sampled pharmacies and patent medicine stores were eligible to participate if they were willing to allow the researcher access to their shops. If not, they were excluded and another pharmacy/ patent store randomly selected.

Data collection instrument

A form was designed to collect the data. The form collected data on: the dosage form of the FDC; Generic names and strengths of the active ingredients; country of manufacture and evidence of registration with the Nigerian drug regulatory agency –the National Agency for Food and Drug Administration and Control (NAFDAC).

Data collection

Shop owners or other personnel working in the visited premises were initially approached and informed about the objectives of the study. Afterwards, their permission was sought to collect data from their shops. If they agreed, the

Table 1. Scoring rubric used to assess rationality

Item	How it was assessed	Scoring
Registration status of API(s)	NAFDAC Drug registration database was checked	Depending on the number of drugs in the FDCs. If two, score 0.5 each for each drug listed on the NAFDAC drug database, if three score 0.33 each, and so on. . Exclude drugs not used singly from this analysis
FDC listing in Nigerian or WHO Essential Medicines List	Manual check of both lists	If listed in only one Essential Medicines List (Nigerian /WHO model list), score half but if both, score 1
Efficacy of API	Check of relevant drug monograph on Medscape or drugs.com	Depending on the number of drugs in the FDCs. If two, score 0.5 each for each drug as long as there is evidence of its efficacy. If three, score 0.33 each, and so on. Exclude drugs not used singly from this analysis
Efficacy of the FDC	Search of the online database-drugs.com	If there is a monograph for the FDC-score 1, otherwise score 0.
Pharmacokinetics	Check for interactions using the online Medscape drug interaction checker,	If favorable* - score 1. If unfavorable, score -1 and if none, score 0.
Pharmacodynamics	Standard Pharmacology textbooks	If FDC components have similar mechanism of action, score 0 but if their mode of action is different, score 1
Advantage of reduced dose	Relevant drug monograph on Medscape or drugs.com	Depending on the number of drugs in the FDCs. If two, score 0.5 for each API that is used at a lower dose than usual. If three, score each reduced dose API 0.33 and so on.
Advantage of convenience		If the pill count/ dose of FDC is less than taking the individual components singly, score 1. If not, score zero

* Drug interactions were only checked for active ingredients. We defined favorable PK interactions as situations where one AI had beneficial effects on another by prolonging one of its PK parameters.
API: Active Pharmaceutical Ingredient; FDC: Fixed Dose Combination; WHO: World Health Organization; NAFDAC: National Agency for Food and Drug Administration

Table 2. Available FDCs in Surveyed Outlets			
Dosage form	**No of FDCs available; n (%)**	**No. of APIs present**	**Average no of APIs**
Oral tablets/Capsules	74(48.4)	2-4	2.2
Oral liquids	52(34)	2-6	3.1
Topical semi-solids	23(15)	2-5	3
Injectables	2 (1.3)	2	2
Pessaries	2 (1.3)	2-3	2.5

researcher identified medication containing more than one active ingredient and collected relevant information from the drug packaging. Only drugs containing at least one known active pharmaceutical ingredient for which there was some evidence of efficacy were included in the study. On this basis, multivitamin, nutraceutical and herbal FDC formulations were excluded. In addition, data was also not collected for other categories of FDCs including parenteral fluids and inhalers/aerosols. Data was only collected once for each FDC combination, so even if the same combination was produced/marketed by a different pharmaceutical company, data was not collected again.

Data analysis

Data collected was coded and entered into a Microsoft excel spreadsheet for analysis. Descriptive statistics (frequencies and percentages) were used to report the data collected.

To check if a particular FDC was present on the Nigerian essential medicines list (6th Ed, 2016) or the World Health Organization (WHO) model list of essential medicines (20th Ed, 2017), a manual search of both lists was carried out.

To assess rationality, a scoring rubric was developed from checklists used in earlier studies by Dalal *et al*. and Shah et al.[4,11] After modification, the final checklist contained eight items, each of which could be scored a maximum of one mark-making eight the highest achievable score by any FDC. See Table 1 for further details of the scoring rubric. Things assessed by this rubric included: the NAFDAC registration status of each Active Pharmaceutical Ingredient (API) in the FDC and whether the pharmacodynamics and pharmacokinetics of the active ingredients in the FDC were favorable. We also assessed whether there was any evidence for the efficacy of the FDC, which we defined as the presence of a monograph on the FDC on either drugs.com or Medscape stating that the FDC could be used to treat/manage one or more conditions.

To decide on a cutoff value for rationality, seven FDCs included on both the Nigerian and the WHO model Essential Medicines Lists (EMLs) were assessed using the scoring rubric, and their average score (5) chosen as the cutoff.

RESULTS

A variety of FDCs (n=153) in different forms were available at the visited outlets. The number of active pharmaceutical ingredients in these FDCs ranged from two to six (Table 2). Majority of the FDCs were manufactured in Nigeria (36.6%) and India (33.6%), while the others were produced in other countries including the United Kingdom, France, Egypt and others

Available FDCs could be classified into several pharmacological classes. The analgesics contained at least one Non-steroidal anti-inflammatory drug (NSAID), while anti-infectives were mostly antibiotic combinations, and a few anti-malarial drugs.

Majority of the oral solid fixed-dose combinations were antihypertensives and anti-infectives (Table 3). Similarly, over half of the oral liquid FDCs were drugs acting on the respiratory tract-especially cold and cough preparations. Most of the topical semi-solid FDCs encountered were anti-infective drugs containing antibiotic, antifungal and corticosteroid combinations.

Majority of the available FDCs were registered by the Nigerian drug regulatory agency. However, less than 10% of them in total were found to be included on either the Nigerian essential medicines list or the WHO model list of essential medicines (Table 4).

Rationality was assessed for all of the oral tablets (n=74) and selected oral liquid FDCs (n=25) encountered. The other liquid FDCs that were not assessed either also came in oral tablet forms (i.e. they had already been evaluated), or they were FDCs acting on the gastrointestinal or respiratory tracts that contained more than two APIs that could not be used individually for treatment.

Using a cut-off mark of five out of the total score of eight, 62% (n=46) of the available oral solid FDCs and 48% (n=12) of oral liquids were found to be rational. Of the 41 FDCs found to be irrational, Drugs acting on the respiratory tract (n=12), analgesics (n=11) and anti-infectives (n=9) were the most implicated FDC drug classes.

DISCUSSION

The aim of this study was to describe the availability of fixed-dose combination products sold within the studied areas and to assess the rationality of selected FDCs. Study findings showed that there were a wide variety of FDCs available in the study areas. While majority of the FDCs

Table 3. Pharmacological Classes of the Available FDCs					
Pharmacological Class	**Oral tablets n (%)**	**Oral Liquids n (%)**	**Topical semi-solids n (%)**	**Injectables n (%)**	**Pessaries n (%)**
Anti-hypertensives	19 (25.7)	0	0	0	0
Anti-infectives	18 (24.3)	11 (21.2)	14 (63.6)	02 (100)	02 (100)
Drugs acting on the respiratory tract	06 (8.1)	29 (55.8)	0	0	0
Anti-diabetics	06 (8.1)	0	0	0	0
Others (Contraceptives and centrally acting drugs)	05 (6.8)	0	0	0	0
Drugs acting on the gastrointestinal Tract	04 (5.4)	09 (17.3)	0	0	0

Table 4. FDC local registration status and Presence on National and International EMLs

Description	Oral tablets n (%)	Oral liquids n (%)	Semi solids n (%)	Injectables n (%)	Pessaries n (%)
Presence of NAFDAC Registration	69(93.2%)	46(88.5%)	21(91.3%)	2(100%)	2(100%)
Presence on the National EML	9(12.2%)	3(5.8%)	0(0%)	1(50%)	0(0%)
Presence on the WHO model list	8(10.8%)	1(1.9%)	0(0%)	1(50%)	0(0%)

were registered with the Nigerian drug regulatory agency, some of the combinations were found to be irrational.

Several studies have reported that FDCs are widely available in several countries including India and Nepal, as was the case in this study. Similarly, the most common pharmacological classes encountered, number of APIs and dosage forms of available FDCs in this study all followed similar trends to the results reported in these studies.[3,4,11]

Most of the FDCs encountered during this study were registered by the Nigerian drug regulatory body, even though quite a few of them were found to be irrational. In contrast, studies from other parts of the world have reported fairly high numbers of unregistered FDCs within their pharmaceutical markets.[10,13,14] Although FDC registration is important, this is however not as important as the need to develop definitive criteria to register these drugs. While regulatory authorities in developed countries have recognized the importance of FDCs, and developed specific guidelines for their registration and control, this is not the case in some developing countries.[4,10,21] Results from this study also seem to suggest that Nigeria might be one of these countries.

Essential medicines are drugs rationally chosen to satisfy the health care needs of the majority of the population.[22] These drugs are included on essential medicines lists, and have sufficient scientific data supporting their use. Less than 10% of the available FDCs in this study were included on either the Nigerian or WHO model essential medicine lists. This is very similar to results from other studies on this topic, that have all reported that only around 10% or less of the FDCs in their studies could be found on the EMLs of their specific countries or on the WHO model list.[3,4,11]

Of the 99 drugs assessed for rationality in this study, over half of them were found to be rational. Majority of these rational FDCs were antihypertensives and antidiabetics. Several antihypertensive FDCs offer better blood pressure control and improved patient medication adherence when compared with free drug combinations.[7,23] Furthermore, antihypertensive FDC use may also reduce the occurrence of adverse effects associated with treatment.[23] In the same vein, oral antidiabetic FDC use by patients is associated with lower health care costs, better patient compliance and a higher likelihood of HbA1c goal attainment.[5,24]

Conversely, Majority of the irrational FDCs in this study were drugs acting on the respiratory tract, analgesics and anti-infectives. Other studies that have assessed FDC rationality have also reported problems with several FDCs within those drug classes.[4,11,12] Studies by Roy *et al*. and Shah *et al*. have all reported that substantial proportions of FDCs acting on the respiratory tract are not rational.12 Similar problems have been reported with anti-infective FDCs, with several researchers questioning the pharmacological and therapeutic basis for several antibiotic containing FDCs.[12,14] In addition, even though this study did not assess the rationality of encountered topical FDCs. Many of the most common type of topical FDCs in our study (FDCs containing antibiotics, antifungals and corticosteroids) have also been reported to be irrational, and several of them have been banned by the Indian government.[25,26]

Limitations of this study include the nature of the sampling technique used. While we tried to cover as wide an area as possible, we cannot be sure that we didn't inadvertently miss some available FDCs. In addition, this study was carried out in only one state within the country, and may not be fully generalizable to others. Finally, we can also not totally rule out the possibility that our scoring rubric and selected cut off score of five might have over or underestimated actual FDC rationality.

CONCLUSIONS

In conclusion, a wide variety of FDCs were available and most of them were found to be registered by the Nigerian drug regulatory agency. Only a few of the available FDCs were included in the essential medicine lists of Nigeria and that of the WHO, and several FDCs were found to be irrational. Findings from this study suggest that there is an urgent need for policy makers and drug regulatory authorities within the country to develop better detailed guidelines governing the registration of FDCs, and ensure that FDCs are only registered if there is sufficient data supporting their effectiveness and safety.

CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

FUNDING

This project did not receive any funding. All costs associated were entirely borne by the authors.

References

1. Gautam CS, Saha L. Fixed dose drug combinations (FDCs): rational or irrational: a view point. Br J Clin Pharmacol. 2008;65(5):795-796. https://doi.org/10.1111/j.1365-2125.2007.03089.x
2. Wirtz VJ, Mol PG, Verdijk J, Vander Stichele RH, Taxis K. Use of antibacterial fixed-dose combinations in the private sector in eight Latin American Countries between 1999 and 2009. Trop Med Int Health. 2013;18(4):416-425. https://doi.org/10.1111/tmi.12068
3. Poudel A, Mohamed Ibrahim MI, Mishra P, Palaian S. Evaluation of the registration status of fixed-dose drug combinations in Nepal. J Pharm Health Serv Res. 2018;9(1):41-46. https://doi.org/10.1111/jphs.12205

4. Dalal K, Ganguly B, Gor A. Assessment of rationality of fixed dose combinations approved in CDSCO List. J Clin Diagn Res. 2016;10(4):FC05-FC08. https://doi.org/10.7860/JCDR/2016/17856.7691
5. Lokhandwala T, Smith N, Sternhufvud C, Sörstadius E, Lee WC, Mukherjee J. A retrospective study of persistence, adherence, and health economic outcomes of fixed-dose combination vs loose-dose combination of oral anti-diabetes drugs. J Med Econ. 2016;19(3):203-212. https://doi.org/10.3111/13696998.2015.1109518
6. Harris SB. The power of two: an update on fixed-dose combinations for type 2 diabetes. Expert Rev Clin Pharmacol. 2016;9(11):1453-1462. https://doi.org/10.1080/17512433.2016.1221758
7. Verma AA, Khuu W, Tadrous M, Gomes T, Mamdani MM. Fixed-dose combination antihypertensive medications, adherence, and clinical outcomes: A population-based retrospective cohort study. PLoS Med. 2018;15(6):e1002584. https://doi.org/10.1371/journal.pmed.1002584
8. ReAct, Why are fixed dose combinations of antibiotics generally not a good idea?. https://www.reactgroup.org/news-and-views/news-and-opinions/year-2018/why-are-fixed-dose-combinations-of-antibiotics-generally-not-a-good-idea/ (accessed Dec 28, 2018).
9. Ahmad A, Khan MU, Balkrishnan R. Fixed-dose combination antibiotics in India: global perspectives, Lancet Glob Health. 2016;4(8):e521. https://doi.org/10.1016/S2214-109X(16)30093-6
10. Poudel A, Mohamed Ibrahim MI, Mishra P, Palaian S. Assessment of the availability and rationality of unregistered fixed dose drug combinations in Nepal: a multicenter cross-sectional study. Glob Health Res Policy. 2017;2:14. https://doi.org/10.1186/s41256-017-0033-z
11. Shah S, Patel J, Desai M, Dikshit RK. Critical analysis of antimicrobial and respiratory fixed dose combinations available in Indian market. Int J Med Public Health. 2015;5(2):161-164. http://dx.doi.org/10.4103/2230-8598.153828
12. Roy V, Malhotra R, Tayal V, Bansal A, Gupta KS. Fixed-dose combinations for cough and common cold in India: an assessment of availability and rationality. Fundam Clin Pharmacol. 2011;25(2):258-266. https://doi.org/10.1111/j.1472-8206.2010.00840.x
13. McGettigan P, Roderick P, Mahajan R, Kadam A, Pollock AM. Use of Fixed Dose Combination (FDC) Drugs in India: Central Regulatory Approval and Sales of FDCs Containing Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), Metformin, or Psychotropic Drugs. PLoS Med. 2015;12(5):e1001826. https://doi.org/10.1371/journal.pmed.1001826
14. McGettigan P, Roderick P, Kadam A, Pollock A. Threats to global antimicrobial resistance control: Centrally approved and unapproved antibiotic formulations sold in India. Br J Clin Pharmacol. 2019;85(1):59-70. https://doi.org/10.1111/bcp.13503
15. FMOH, Essential Medicines List Nigeria 6th Edition, Federal Ministry of Health Nigeria, Abuja, 2016.
16. WHO, WHO Model List of Essential Medicines-20th List, World Health Organization, 2017.
17. NPC, Population Distribution by Sex, State, LGA & Senatorial District, National Population Commission, Nigeria, Abuja, 2010.
18. KDSG, Demographics – Kaduna State Government, 2018. https://kdsg.gov.ng/demographics/ (accessed Dec 28, 2018).
19. PCN, List of Licensed Pharmacists and Licensed Pharmaceutical Premises, Pharmacists Council of Nigeria, Abuja, 2016.
20. Beyeler N, Liu J, Sieverding M. Systematic review of the role proprietary and patent medicine vendors in healthcare Provision in Nigeria. PLoS One. 2015;10(1):e0117165. https://doi.org/10.1371/journal.pone.0117165
21. Desai D, Wang J, Wen H, Li X, Timmins P. Formulation design, challenges, and development considerations for fixed dose combination (FDC) of oral solid dosage forms. Pharm Dev Technol. 2013;18(6):1265-1276. https://doi.org/10.3109/10837450.2012.660699
22. Hogerzeil HV. The concept of essential medicines: lessons for rich countries. BMJ. 2004;329(7475):1169-1172. https://doi.org/10.1136/bmj.329.7475.1169
23. Gupta AK, Arshad S, Poulter NR. Compliance, Safety, and Effectiveness of Fixed-Dose Combinations of Antihypertensive Agents. Hypertension. 2010 Feb;55(2):399-407. https://doi.org/10.1161/HYPERTENSIONAHA.109.139816
24. Williams SA, Buysman EK, Hulbert EM, Bergeson JG, Zhang B, Graham J. Hemoglobin A1c outcomes and health care resource use in type 2 diabetes mellitus patients treated with combination oral antidiabetic drugs through step therapy and loose-dose and fixed-dose combinations. Manag Care. 2012;21(7):40-48.
25. Kumar S, Goyal A, Gupta YK. Abuse of topical corticosteroids in India: Concerns and the way forward. J Pharmacol Pharmacother. 2016;7(1):1-5. https://doi.org/10.4103/0976-500X.179364
26. Pande S. Steroid containing fixed drug combinations banned by government of India: A big step towards dermatologic drug safety. Indian J Drugs Dermatol. 2016;2(1):1-2. https://doi.org/10.4103/2455-3972.184102

Original Research

Information seeking behavior and awareness among physicians regarding drug information centers in Saudi Arabia

Dlal A. ALMAZROU, Sheraz ALI, Dalal A. AL-ABDULKARIM, Ahmed F. ALBALAWI, Jasser A. ALZHRANI.

Received (first version): 19-Mar-2019 Accepted: 2-Jun-2019 Published online: 11-Jun-2019

Abstract

Background: The role of Drug Information Center (DIC) in a health-care setting has increased tremendously owing to the high influx of pharmaceutical molecules that pose serious challenges to physicians. DIC promotes rational prescribing behavior among physicians, leading to better patient outcome.

Objectives: This study aimed to explore information-seeking behaviors and awareness of physicians regarding DIC services in the Kingdom of Saudi Arabia.

Methods: A cross-sectional study was conducted among physicians working in government and private sectors between June to November 2018 by using an 18-item electronic anonymous questionnaire. Descriptive and inferential statistics were performed using IBM SPSS (Version 21). A P-value of <0.05 was taken as the level of significance between responses.

Results: In total, 500 questionnaires were distributed among the included hospitals, and only 254 physicians (response rate: 50.8%), including 193 males (76%), participated in the study. The majority of participants (n = 83, 32.7%) had more than ten years of experience, and many of the respondents (n=131) worked as residents. Most of the physicians (62.9%) were aware of their institutional DIC. UpToDate was the most preferred drug information database among physicians. Regarding the improvement required in the DIC services, most of the physicians (23.6%) opined that the contact details should be available in all clinical wards.

Conclusions: Only 10% of the respondents were not aware of the presence of DIC at their institution. The UpToDate online drug information database was the most frequently used database by the physicians. Our findings showed that there is a need for conducting educational programs for physicians regarding DIC services. Such an attempt can increase the frequency of drug-related queries and promote patient safety.

Keywords

Drug Information Services; Information Seeking Behavior; Awareness; Physicians; Reference Books; Surveys and Questionnaires; Saudi Arabia

INTRODUCTION

Professionals in clinical care experience information paradox but find it time-consuming to search and appraise scientific evidence.[1] Such professionals can take the help of Drug Information Centers (DICs) that provide unbiased and factual drug information, focusing on Patient-Oriented Evidence that Matters (POEMs).[2-4] The POEMs strategy is based on the following three criteria: 1) it addresses a question that physicians encounter; 2) it measures the outcomes that physicians and their patients care about such as symptoms, morbidity, quality of life, and mortality; and 3) it has the potential to change the way physicians practice.[5] However, self-reliance on information technology has affected the relationship between healthcare professionals and DIC personnel.

Dlal Abdulrahman ALMAZROU. King Saud Medical City, Ministry of Health. Riyadh, (Saudi Arabia). d.almazrou@ksmc.med.sa
Sheraz ALI. King Saud Medical City, Ministry of Health. Riyadh, (Saudi Arabia). sheraz@ksmc.med.sa
Dalal Abdulrazaq AL-ABDULKARIM. Pharmaceutical Care Department, King Abdulaziz Medical City, Ministry of National Guard Health Affairs. Riyadh (Saudi Arabia). alabdulkareemda@ngha.med.sa
Ahmed Furayj M. ALBALAWI. King Saud Medical City, Ministry of Health. Riyadh, (Saudi Arabia). ahmadfreej@gmail.com
Jasser Ali S. ALZHRANI. Pharmaceutical Care Department, East Jeddah Hospital, Directorate of Health Affairs, Ministry of Health. Jeddah (Saudi Arabia). ph.jasser@gmail.com

A previous study in Saudi Arabia that assessed DIC queries of a particular year at a 1400 bed setting revealed that merely 24% of physicians consulted DIC pharmacists for drug-related queries while the majority (61%) of the queries were asked by pharmacists.[6] Likewise, a major DIC in Iran found that merely 19% queries were asked by physicians. Drug reference books, advice from colleagues, and scientific papers/journals were reported as the frequently utilized drug information resources by physicians.[7] The brochures of pharmaceutical companies was another common source of drug information for physicians; however, brochures lacking appropriate scientific evidence can also compromise patient safety.[8] Physicians are the first point of contact in clinical care, and their acquaintance with evidence-based drug information promotes rational prescribing behaviors that eventually lead to a better patient outcome.[7]

Although the first DIC was established in Saudi Arabia in the late 1970s, there is a dearth of empirical evidence pertinent to drug information seeking behaviors and acquaintance of practicing physicians regarding DICs in Saudi Arabia.[6] Therefore, this study aimed to ascertain information seeking behaviors and awareness of physicians regarding DIC services. This study also aimed to calculate the average ranking of physicians' opinions regarding the improvement of DIC services. The findings of this study will aid in the

implementation of awareness and educational programs, thus, improving the DIC services, frequency of drug queries, and patient safety.

METHODS

Design and setting

A cross-sectional survey was conducted between June 2018 to November 2018 for investigating information seeking behaviors and awareness of licensed physicians (working in the central, eastern, western and northern regions of the Saudi Arabia) regarding DIC services.

Of the total 415 hospitals (excluding health centers and private clinics) in Saudi Arabia, 249 hospitals are managed by the Ministry of Health. Almost half of the over 66,000 physicians in Saudi Arabia work for the Ministry of Health.[9] In addition, it has been estimated that there are 24 physicians per 10,000 persons. Currently, there are 31 DICs in the Saudi Arabia that respond to inquiries from healthcare professionals and the public; however, not all hospitals in the Saudi Arabia have an operational DIC unit.[6] Moreover, there is a National Drug Information Center under the umbrella of the Ministry of Health that aims to provide drug-related consultation services through the hotline calling service.[10]

Data collection and ethical approval

An 18-item electronic anonymous questionnaire was designed based on previous similar studies with some modifications.[3] A web link of the survey questionnaire was distributed to 20 randomly selected group of private and government hospitals throughout the Saudi Arabia. In order to avoid selection bias, all physicians employed in the selected hospitals received an invitation to participate in the survey. The study objectives were included on the first page of the questionnaire under the consent statement to provide general information to the study participants. The questionnaire asked questions related to demographics, information seeking behaviors, awareness and opinions. This non-invasive study was initiated after obtaining approval from the Institutional Review Board of King Saud Medical City (Reference: H1RI-19-Mar18-01).

Sample size and statistical analysis

In order to elicit a response in 33% of respondents regarding awareness of DIC, with 95% confidence level, a sample size of 335 was estimated. The sample size was calculated by an online sample size calculator. Data analysis was carried out using the SPSS software, version 21 (IBM. Armonk, NY: IBM Corp). Descriptive and inferential statistics were used to report the data. The influence of gender, experience and designation differences on the responses of awareness of hospital and national DIC questions was evaluated by performing chi-square test.

Average ranking

Ranking questions (physician's opinion for improving DIC services) calculates the average ranking for each answer choice in order to determine the most preferred answer choice.[11] The answer choice with the largest average ranking is the most preferred choice.

The average ranking is calculated as follows:

Average ranking = (x1w1 + x2w2 + x3w3 ... xnwn)/Total response count

Where,

x = response count for answer choice

w = weight of ranked position (weights are applied in reverse)

RESULTS

A total of 500 electronic questionnaires were distributed during the study period, and only 254 physicians completed the survey, i.e., 50.8% response rate. Majority of the respondents (n=193, 76%) were male, whereas one-third of the physicians (n=83; 32.7%) had over ten years of clinical experience. Nearly half of the respondents (n=131) were residents. Of these respondents, 85 (33.5%) and 46 (18.1%) were specialists and consultants, respectively. Regarding the use of DIC services, 48% of the respondents mentioned that they had used DIC services, and more than half of the physicians never contacted the DIC for drug-related queries during their professional practice. When asked about getting orientation from DIC personnel regarding DIC services, merely 36.2% of physicians responded positively. Moreover, 96 respondents (37.8%) had contacted DIC six months before the initiation of this study. Forty-two percent of the respondents indicated that they can get the required information from drug information databases available at their institution; this was the most common reason for not contacting the DIC. Other reasons were insufficient time (86, 33.9%) and lack of knowledge regarding DIC (78, 30.7%). The majority (66.1%) of the physicians contacted DIC by telephone, followed by the submission of papers or electronic forms (18.1%). The summary of these results is listed in Table 1.

The most frequently utilized DIC service by physicians was related to drugs (Table 1). Two-thirds of the queries asked by the physicians were related to the dosage and administration of drugs, followed by drug-drug interaction (58.7%) and adverse drug reaction (37%). Table 1 also shows that UpToDate was the most preferred drug information database among physicians, followed by Lexicomp and Micromedex. Majority of the respondents were aware of the existence of DIC at the institutional and national levels. Table 2 shows that there is a statistically significant difference between the designations of the respondents, earlier use of DIC services, received an orientation from the DIC pharmacist, and awareness of both institutional and national DIC.

The respondents ranked five opinions for the improvement of DIC services. Sixty physicians (23.6%) considered the availability of the DIC contact details in all clinical wards as the most important area of improvement. Eighty-six physicians (33.9%) considered training and orientation about DIC services as the most important area of improvement. More than half of the physicians (n=137) identified the frequent dissemination of recently published scientific studies to the healthcare professionals as the least important of the suggestions (Table 3).

Table 1. Characteristics and information seeking behaviors of physicians included in the survey (N = 254).

Characteristics	N (%)
Gender	
Male	193 (76)
Female	61 (24)
Experience	
Less than 2 years	51 (20)
2-5 years	65 (25.6)
6-10 years	55 (21.7)
Over 10 years	83 (32.7)
Designation	
Consultant	46 (18.1)
Specialist	85 (33.5)
Resident	123 (48.4)
Region	
Central	174 (68.5)
Eastern	5 (1.97)
Western	13 (5.12)
Northern	62 (24.41)
Have you ever used DIC services?	
Yes	122 (48)
No	132 (52)
Which drug information services you earlier used? (You may select more than one answer)	
Drug-related question	108 (42.5)
Formulary addition request form	39 (15.4)
Direct purchase for non-formulary drugs	26 (10.2)
Approved drug for unapproved indication “Off-label use” request form	33 (13)
Summary of Product Characteristics	25 (9.8)
Poison related query	42 (16.5)
Drug recall	25 (9.8)
Experimental/Investigational drugs	7 (2.8)
None of them	102 (40.2)
Have you ever received orientation from drug information pharmacist/personnel regarding DIC services?	
Yes	92 (36.2)
No	162 (63.8)
Did you ask or requested any information regarding any drug from your hospital’s DIC in the last 6 months?	
Yes	96 (37.8)
No	158 (62.2)
What are the possible reasons for not contacting DIC for any drug-related query? (Respondents were able to select more than one option)	
Insufficient time.	86 (33.9)
There is no DIC in your hospital/institute.	30 (11)
I can get the information from a drug information database that is available in the hospital/institute.	108 (42.5)
I do not know how to contact DIC.	78 (30.7)
I do not know about the scope and services of DIC.	57 (22.4)
Other *	24 (9.4)
Do you have access to any electronic drug information database in your hospital (e.g., Micromedex, Lexicomp, UpToDate)?	
Yes	171 (67.3)
No	48 (18.9)
Not sure	35 (13.8)
What is the drug information database that you have in your hospital?	
Lexicomp	71 (28)
Micromedex	35 (13.8)
UpToDate	87 (34.2)
Other	61 (24)
In your opinion, what is the most common type of drug-related query you usually ask from DIC? (You may select more than one answer)	
Dosage/Administration	171 (67.3)
Drug-Drug Interaction	149 (58.7)
Adverse Drug Reaction	94 (37)
Drug availability/Formulary	87 (34.3)
Pregnancy/Lactation	72 (28.3)
Therapeutic Use/Indication	65 (25.6)
General Drug Information	48 (18.9)
Stability/Compatibility	25 (9.8)

Table 1 (cont.). Characteristics and information seeking behaviors of physicians included in the survey (N = 254).	
What is the drug information resource that you prefer to use?	
Lexicomp	62 (24.4)
Micromedex	26 (10.2)
UpToDate	100 (39.4)
British National Formulary (BNF)	15 (5.9)
Saudi National Formulary (SNF)	5 (2)
Package Insert/ Drug leaflet	3 (1.2)
Textbooks or electronic books	19 (7.5)
Official websites (Saudi FDA, US FDA)	11 (4.3)
Other	13 (5.1)
How do you usually contact DIC?	
By telephone	168 (66.1)
By email	18 (7.1)
By visiting DIC	22 (8.7)
Drug information form (paper/ electronic)	46 (18.1)
*Other: Most respondents mentioned that there is a clinical pharmacist in their ward so they ask them instead of contacting DIC, and some mentioned that they can get the information from the internet.	

DISCUSSION

As per our knowledge, this is the first study in the recent 15 years that assessed information seeking behavior and awareness regarding DICs among physicians in the Saudi Arabia. There is a scarcity of literature on the studied topic as the recently published studies mainly focused on the assessment of DIC services provided to the healthcare professionals.[6,12] Similarly, previous studies predominantly reported the statistics of the DIC activities.

Our study shows that more than two-thirds of the respondents were male, reflecting the existing male and female proportionality among physicians.[13-14] In addition, nearly one-third of the physicians were experienced professionals. This study also revealed that a majority of the physicians were aware of the existence of DIC at their institutions. However, these findings contradict earlier reports.[3,15] Thirty-seven percent of the physicians contacted DIC six months before the initiation of this study, which accords well with the previous findings.[3] In the present study, UpToDate was the most common online resource utilized by physicians for drug-related queries; this finding is comparable to the results reported in other studies.[16] UpToDate is an evidence-based, peer-reviewed reference that is accessible through the web and mobile application and requires an individual and group subscription.[17] It provides updated clinical information at the point of care.[18] A retrospective study in the US reported that the usage of UpToDate eventually reduced the patient's hospital stay and mortality rates.[18] According to the findings of a cross-over randomized trial, healthcare professionals relatively spend less time on UpToDate for information retrieval compared to PubMed.[19]

In this study, two-thirds of the respondents sought information from DIC by telephone, which is in line with earlier reports.[12,20] We also found that the most frequent type of DIC query requested by physicians was related to the dosage and administration of drugs. This strengthens the findings of previous studies.[6,12,21] Our study revealed that a significant proportion of the respondents were aware of the hospital and national DICs after receiving DIC orientation regarding their services. This finding corroborates the findings of a study conducted in Malaysia.[22] Physicians identified the availability of DIC contact number in every clinical ward as the most important area of need. This will facilitate the physicians to ask queries to the DIC personnel in a timely manner, thus avoiding delay in the treatment process and improving

Table 2. Awareness of the existence of hospital and national DIC.

Physician category	Awareness of hospital DIC; N (%)				Awareness of National DIC; N (%)			
	Yes	No	Not sure	p-value	Yes	No	Not sure	p-value
Gender				0.377				0.539
Male	122 (63.2)	23 (11.9)	48 (24.9)		85 (44)	68 (35.2)	40 (20.7)	
Female	38 (62.3)	4 (6.6)	19 (31.1)		22 (36.1)	24 (39.3)	15 (24.6)	
Experience				<0.001*				0.095
Less than 2 years	23 (45.1)	2 (3.9)	26 (45.1)		20 (39.2)	16 (31.4)	15 (29.4)	
2-5 years	40 (61.5)	5 (7.7)	20 (30.8)		20 (30.8)	26 (40)	19 (29.2)	
6-10 years	42 (76.4)	8 (14.5)	5 (9.1)		24 (43.6)	21 (38.2)	10 (18.2)	
Over 10 years	55 (66.3)	12 (14.5)	16 (19.3)		43 (51.8)	29 (34.9)	11 (13.3)	
Designation				0.036*				0.028*
Consultant	35 (76.1)	4 (8.7)	7 (15.2)		23 (50)	16 (34.8)	7 (15.2)	
Specialist	54 (63.5)	13 (15.3)	18 (21.2)		43 (16.1)	30 (18.1)	12 (14.2)	
Resident	71 (57.7)	10 (8.1)	42 (34.1)		41 (33.3)	46 (37.4)	36 (29.3)	
Have you ever used DIC services?				<0.001*				<0.001*
Yes	103 (84.4)	7 (5.7)	12 (9.8)		80 (65.5)	29 (23.8)	13 (10.7)	
No	57 (43.2)	20 (15.2)	55 (41.7)		27 (20.5)	63 (47.7)	42 (31.8)	
Have you ever received orientation from DIC pharmacist or personnel regarding drug information services				<0.001*				<0.001*
Yes	79 (85.9)	7 (7.6)	6 (6.5)		59 (64.1)	23 (25)	10 (10.9)	
No	81 (50)	20 (12.3)	61 (37.7)		48 (29.6)	69 (42.6)	45 (27.8)	
*p<0.05, level of significance								

Table 3. Physicians' opinion on improving drug information services.

Rank n (%)	1	2	3	4	5	*Average rank
DIC contact information should be available in every ward	60 (23.6)	95 (37.4)	43 (16.9)	34 (13.4)	22 (8.7)	3.54
More training/orientation about DIC services should be provided	86 (33.9)	49 (19.3)	51 (20.1)	35 (13.8)	33 (13.0)	3.47
Providing mobile subscriptions of major drug information databases	58 (22.8)	66 (26.0)	66 (26.0)	39 (15.4)	25 (9.8)	3.37
Drug information services should be provided 24 hours in a healthcare setting	34 (13.4)	29 (11.4)	66 (26.0)	88 (34.6)	37 (14.6)	2.74
Frequent dissemination of latest scientific studies to healthcare professionals	16 (6.3)	15 (5.9)	28 (11.0)	58 (22.8)	137 (53.9)	1.88

*The average ranking = (x1w1 + x2w2 + x3w3 ... xnwn) /Total response count; where: w = weight of ranked position. x = response count for answer choice
Note**:** The Ranking question asks respondents to compare items to each other by placing them in order of preference. Respondents rank the answer choices in order of preference, 1 being the highest and 5 being the least preferred. Weights are applied in reverse. In other words, the respondent's most preferred choice (which they rank as #1) has the largest weight, and their least preferred choice (which they rank in the last position) has a weight of 1.

patient safety. Training or orientation about DIC services was found to be the second most preferred choice for improving the services of DIC. It has been reported that the DIC of the largest and flagship tertiary care setting in the Saudi Arabia previously received merely 139 queries during one calendar year.[6] However, physicians consider DIC pharmacists as a reliable source of information as they provide unbiased and factual information about drugs to the healthcare providers.[2,23]

This is the first study that sought physicians' opinions for the improvement of DIC services in the Kingdom. The diversity in the studied hospitals ensured the generalizability of our findings. However, a limitation of this study is the relatively low number of respondents. This may be because healthcare professionals constantly receive irrelevant survey requests from different sources and, thus, could have ignored important surveys pertinent to their professional field such as our survey. Likewise, the low response rate is frequently cited as a weakness of online surveys.[24-26] Nonetheless, our study sample is unlikely to be representative and lacks the power for statistical testing. As per earlier literature, electronic survey's response rates may only approximate 25% to 30% with the maximum rate of 70%.[27] Our study response rate was well above the cited approximate range.

CONCLUSIONS

This study found that the majority of licensed physicians working in the Saudi Arabia were aware of the existence of DIC at the institutional and national levels. UpToDate was the most frequently utilized online drug information database among physicians in the Kingdom. Our findings revealed that there is a need to provide the contact details of DICs to all clinical wards. Training should also be provided to physicians regarding DIC services so as to facilitate drug consultation from DIC personnel and promote patient safety. Future studies are needed to explore the impact of DIC services on the professional performance of physicians.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

This study received no funding.

References

1. Judith H. Patient-oriented evidence that matters: POEMS. Eur J Hosp Pharm. 2004;11:56-57.
2. Ghaibi S, Ipema H, Gabay M; American Society of Health System Pharmacists. Pharmacists ASHP guidelines on the pharmacist's role in providing drug information. Am J Health Syst Pharm. 2015;72(7):573-577. https://doi.org/10.2146/sp150002
3. Abou-Auda HS. Information-seeking behaviors and attitudes of physicians toward drug information centers in Saudi Arabia. Saudi Med J. 2008;29(1):107-115.
4. Rosenberg JM, Koumis T, Nathan JP, Cicero LA, McGuire H. Current status of pharmacist-operated drug information centers in the United States. Am J Health Syst Pharm. 2004;61(19):2023-2032. https://doi.org/10.1093/ajhp/61.19.2023
5. Smith R. A POEM a week for the BMJ. BMJ. 2002;325(7371):983. https://doi.org/10.1136/bmj.325.7371.983
6. Almazrou DA, Ali S, Alzhrani JA. Assessment of Queries Received by the Drug Information Center at King Saud Medical City. J Pharm Bioallied Sci. 2017;9(4):246-250. https://doi.org/10.4103/jpbs.JPBS_166_17
7. Oshikoya KA, Oreagba I, Adeyemi O. Sources of drug information and their influence on the prescribing behaviour of doctors in a teaching hospital in Ibadan, Nigeria. Pan Afr Med J. 2011;9:13. https://doi.org/10.11604/pamj.2011.9.13.478
8. Gharibyar H, Sharif Y. Evaluation of pharmaceutical drug information brochures in the Emirate of Abu Dhabi (United Arab Emirates). J Pharm Health Serv Res. 2012;3(1):57-62. https://doi.org/10.1111/j.1759-8893.2011.00071.x
9. Ministry of Health Saudi Arabia. Health Indicators for the year of 1431 H. Available at: https://www.moh.gov.sa/en/Ministry/Statistics/Indicator/Pages/Indicator-2012-01-10-0001.aspx (accessed Mar 10, 2019).

10. Alomi YA, Almudaiheem HY, Alarnous T, Alshurei S, Alsharafa A, Alzahrani T, Albassri H, Alenizi K, Alreshedi M, Alathan M, Aljohany N. Cost-Efficiency of national drug information center through Ministry of Health hotline calling services (937) in Saudi Arabia application of a Mercian Model. Value Health. 2015;18(7):A735. https://doi.org/10.1016/j.jval.2015.09.2815
11. Ranking Question. SurveyMonkey Inc. Available at: https://help.surveymonkey.com/articles/en_US/kb/How-do-I-create-a-Ranking-type-question (accessed Mar 10, 2019).
12. Alamri SA, Ali Al Jaizani R, Naqvi AA, Ghamdi MSA.Assessment of drug information service in public and private sector tertiary care hospitals in the eastern province of Saudi Arabia. Pharmacy (Basel). 2017;5(3):37.
13. World Health Organization and Global Health Observa-tory (GHO), Male to Female Ratio of Physicians Density per 1000 Population, Latest Available Year. Available at: http://www.who.int/gho/health_workforce/physicians_density_gender_text/en/index.html (accessed Mar 10, 2019).
14. Healthcare personal statistics-physicians. Eurostat Statistics Explained. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_personnel_statistics_-_physicians (accessed Mar 10, 2019).
15. Gharibyar H, Sharif Y, Al-Quasme K, Fahmy S. Physicians perception of drug information resources in the emirate of Abu Dhabi – UAE. J Pharmacol Pharm. 2013, 4, 52-56. http://doi.org/10.4236/pp.2013.41007
16. Hoogendam A, Stalenhoef AF, Robbé PF, Overbeke AJ. Answers to questions posed during daily patient care are more likely to be answered by UpToDate than PubMed. J Med Internet Res. 2008;10(4):e29. https://doi.org/10.2196/jmir.1012
17. Drug information resources and literature retrieval. American College of Clinical Pharmacy. Available online: https://www.accp.com/docs/meetings/UT18/handouts/Drug_Information_Resources_and_Literature_Retrieval_Supplemental_Chapter_PH.pdf (accessed Mar 10, 2019).
18. Isaac T, Zheng J, Jha A. Use of UpToDate and outcomes in US hospitals. J Hosp Med. 2012;7(2):85-90. https://doi.org/10.1002/jhm.944
19. Sayyah Ensan L, Faghankhani M, Javanbakht A, Ahmadi SF, Baradaran HR. To compare PubMed Clinical Queries and UpToDate in teaching information mastery to clinical residents: a crossover randomized controlled trial. PLoS One. 2011;6(8):e23487. https://doi.org/10.1371/journal.pone.0023487
20. Hazra A, Sen A, Roy S. One year experience of drug information service in the NGO sector. Ind J Pharmacol. 2001;33: 44-45.
21. George B, Rao PG. Assessment and evaluation of drug information services provided in a South Indian teaching hospital. Indian J Pharmacol. 2005;37:315-319.
22. Ali AA, Mohd Yusoff S, Mohd Joffry S, Wahab MA. Drug information service awareness program and its impact on characteristics of inquiries at DIS unit in Malaysian public hospital. Arch Pharm Pract. 2013;4:9-14.
23. Gettig JP, Jordan JK, Sheehan AH. A survey of current perceptions of drug information practice and training. Hosp Pharm. 2009;44:325-331.
24. Funkhouser E, Fellows JL, Gordan VV, Rindal DB, Foy PJ, Gilbert GH; National Dental Practice-Based Research Network Collaborative Group. Supplementing online surveys with a mailed option to reduce bias and improve response rate: the National Dental Practice-Based Research Network. J Public Health Dent. 2014;74(4):276-282. https://doi.org/10.1111/jphd.12054
25. De Leeuw ED. Counting and measuring online: The quality of internet surveys. Bull Sociol Methodol. 2012;114(1): 68-78. https://doi.org/10.1177%2F0759106312437290
26. Van Selm M, Jankowski NW. Conducting online surveys. Qual Quant. 2006;40(3):435-456. https://doi.org/10.1007/s11135-005-8081-8
27. Fincham JE. Response rates and responsiveness for surveys, standards, and the Journal. Am J Pharm Educ. 2008;72(2):43. https://doi.org/10.5688/aj720243