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THE EFFECTIVENESS OF PHARMACIST-LED MEDICATION REVIEW IN PETALING DISTRICT HEALTH OFFICE

WAN MAISARAH WAN AHMAD KAMAL[1*], LEE MEE CHAN[2], ZAKIAH ABAS[3], DARISHINI MURUGIAH[1], GOH YEN JOE[4], NADHRAH RASYIDAH RAMLI[5], LUI PARK YEANG[4], ABDULLAH AZIM ZULKAFLI[2] AND WONG KENG WEI[6]

[1]Taman Medan Health Clinic, Petaling District Health Office, Selangor, Malaysia
[2]Seksyen 7 Shah Alam Health Clinic, Petaling District Health Office, Selangor, Malaysia
[3]Kelana Jaya Health Clinic, Petaling District Health Office, Selangor, Malaysia
[4]Puchong Health Clinic, Petaling District Health Office, Selangor, Malaysia
[5]Seksyen 19 Health Clinic, Petaling District Health Office, Selangor, Malaysia
[6]Seri Kembangan Health Clinic, Petaling District Health Office, Selangor, Malaysia

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ABSTRACT

Medication review is an important service in optimising medicine use and improves clinical outcomes. This study aims to assess the effectiveness of pharmacist-led medication review on patients' knowledge and adherence. For this prospective study, 480 patients were randomly recruited in six primary healthcare clinics in Petaling District Health Office. Patients were interviewed with a questionnaire and validated medication adherence scale during recruitment and at follow-up visit to assess their medication knowledge and adherence. The data was analysed using Chi-square tests and paired t-tests to determine the correlation between medication knowledge and adherence with patient demographics. Among 408 patients that had completed the follow-up, 16.9% of patients showed medication knowledge deficits on recruitment. However, there is a significant improvement in the medication knowledge indices during the follow-up session ($p < 0.001$). Elderly patients were found to benefit from medication review with better medication knowledge and adherence post-medication review. The study found that the number of good adherers increased by 29.3% after the medication review. A further study demonstrating the effectiveness of medication review in cultivating knowledge retention and sustained adherence in the longer-term is warranted. Future work shall also focus on measuring the cost-effectiveness of pharmacist-led medication review implementation in primary healthcare settings. Pharmacist-led medication review is an essential and effective service in primary health care facilities for patients to enhance their knowledge on their medications, and adherence especially in elderly patients on chronic medications.

[*]Corresponding author: wansarahkamal@gmail.com

Keywords: Pharmacist, Medication review, Patient medication knowledge, Medication adherence, Primary care

INTRODUCTION

To date, the deepening burden of managing diseases amongst patients presents enormous challenges to the public primary care workforce. Patients are usually prescribed several medications to manage their multiple comorbidities and achieve therapeutic outcomes. However, there are risks of drug-related issues associated with the increased number of medications prescribed (Freyer *et al*. 2018; Ramli, Ahmad and Paraidathathu 2012). This subsequently led to suboptimal management, poor clinical outcomes, increased health costs, increased hospital stays and an increased economic burden on the country's healthcare system (Freyer *et al*. 2018; Ramli, Ahmad and Paraidathathu 2012). Examples of drug-related problems include polypharmacy, drug-drug interactions, non-adherence and undesired side effects among others (Kaufmann *et al*. 2015). A study by Costa *et al*. (2015) showed that the primary contributing factor to unsatisfactory clinical outcomes was patients' poor medication knowledge and adherence. Additionally, insufficient knowledge and education regarding proper medication administration contributed to drug-related problem occurrence (Hammerlein, Griese and Schulz 2007). Mainly, knowledge on medication was a significant parameter in determining patients' medication adherence whereby patients with sufficient medication knowledge were able to show good propensity to therapy adherence (Jankowska-Polańska *et al*. 2016; Awwad *et al*. 2015; Karaeren *et al*. 2009; Salama, Yasin and Elbarbary 2017).

Medication review can be a platform to educate patients on medication knowledge, which potentially can lead to an improvement in adherence. Medication review is defined as structured, critical interpretation of patients' prescribed drugs with aims to optimise drug use, enhance therapeutic outcome while identifying and resolving medication-related issues, and reducing waste (Pharmaceutical Care Network Europe n.d.; Clyne, Blekinsopp and Seal 2008). Comorbidities present in patients often require continuous multiple pharmacotherapies which subsequently increase the risk of drug-related problems (Freyer *et al*. 2018). The Royal Pharmaceutical Society encouraged the need for medication review for prescriptions with more than four medications as this was able to produce positive outcomes in medication usage. Medication review helped by facilitating capture and mitigation of pharmaceutical care issues, and hence, simultaneously decreasing the number of hospital admissions (Royal Pharmaceutical Society 2013; Jankowska-Polańska *et al*. 2016; Krska *et al*. 2001; Graaback & Kjeldsen 2013; Christensen & Lundh 2016).

In the current practice in Malaysia, medication reviews are often performed by prescribers and pharmacists to patients or caregivers. However, there is a lack of study findings on the effectiveness of medication reviews conducted by healthcare providers particularly pharmacists in Malaysia. Accordingly, the objective of this study was to fill the research gap in determining the effectiveness of medication reviews performed by pharmacists, and the correlation between patient's demographics and medication knowledge and adherence.

METHODS

Study Design

This exploratory study was conducted in the primary healthcare facilities in the central region of Malaysia under the jurisdiction of Petaling District Health Office from March to June 2020. Approval to conduct the study was obtained from the Malaysian Medical Research and Ethics Committee (MREC) with patient informed consent obtained prior to study participation.

Study Sample

The study was conducted in six primary healthcare clinics with various patient demographics. Patients with chronic diseases who had regular appointments encountered at the pharmacy screening counter were invited to participate in the study. Purposive sampling method was used to recruit potential participants, whereby every tenth chronic illness patient that arrived at the pharmacy screening counter was invited to participate in the study. Participants had to meet the following eligibility criteria: a) they were at least 18 years old; b) diagnosed with type 2 diabetes mellitus (T2DM) and/or hypertension, and lastly, c) they were prescribed a minimum of four medications. To calculate the sample size suitable for the study, the total number of repeat prescriptions from the six primary health clinics was used, with a margin error of 5% and a confidence level of 95%. Using the sample size calculation for large population stated below (Cochran 1963), a minimum sample size of n = 384 was required for the study.

$$\text{Sample size, } n = Z^2 \times (p) \times [(1\text{-}p) / C^2]$$
$$= (1.96)^2 \times [(0.5) \times (1\text{-}0.5)]/(0.05)^2$$
$$= 384.16 \approx 384 \text{ participants}$$

Study Instrument

The data collection process was conducted by trained on-site pharmacists in their respective healthcare facilities. There were two parts of the data collection process involved in the study; one was questionnaire administration, and followed by medication review. The study questionnaire was administered twice; once during study recruitment and another during a follow-up visit (one-month post-medication review). Following the initial questionnaire administration, a structured medication evaluation or medication review was conducted in a counselling room. The first section of the questionnaire consisted of four parts, namely: a) demography, b) patient knowledge, c) other information related to participant's medication knowledge, and d) medication adherence scale. The second section of the questionnaire was the medication knowledge index scoring system adapted from a study by Goh *et al*. (2014) to identify the five indices of medication knowledge.

$$\text{Medication knowledge index scoring system} = \frac{\text{Number of medications correctly verbalised for each knowledge index}}{\text{Total number of medications patients is prescribed}}$$

The responses for the items were scored 1 when the participant answered correctly, and scored 0 when the participant answered wrongly. For example, three medications with indications correctly verbalised/a total of six medications = 0.5. Total score = Σ (patient's individual medication knowledge index score). A total score of 1 indicated participants has verbalised all answers correctly.

The questionnaire was originally in English and then translated into Bahasa Malaysia. Face and content validation was performed by a panel consisting of a research and development committee, and senior pharmacists. Modifications were made based on the feedback gathered to improve the questionnaire clarity, consistency and presentation. A pilot study was conducted among 39 respondents, followed by a reliability test. Cronbach's alpha obtained for the first section of the questionnaire was 0.82. Meanwhile, the medication adherence scale used was adapted from a study by Ramli, Ahmad and Paraidathathu (2012) with a four-point Likert-type response format (none of the time = 4, some of the time = 3, most of the time = 2, and all the time = 1). The Cronbach's alpha calculated for this scale was to be 0.78.

Medication adherence was measured and categorised as follows:

a) Adherence = a full score of 28 or a score of 27 (due to 1 point deducted from any one of the 'unintentional adherence' questions, which were question 1 or question 6)

b) Non-adherence = a score of 26 and below

Statistical Methods

Statistical software for analysis used in the study was SPSS 26.0. A multivariate analysis of Pearson and McNemar test was conducted to determine the significant correlation of demographics on participants' medication knowledge and adherence scores. A paired *t*-test was also used to determine the significant correlation of demographics on participants' medication knowledge and adherence scores.

RESULT

Sample Characteristics

A total of 480 participants were recruited for this study, of whom 408 completed the follow-up (85%), and a 15% dropout rate. Nearly half of the participants were aged 61 years old and above (*n* = 190/408, 46.6%). More than three-quarters of the participants were married (*n* = 320/408, 78.4%), and live with family members (*n* = 388/408, 95.1%). Ninety percent of the participants were able to take their medications independently (*n* = 371/408), with the remaining of them requiring a caregiver and/or assistance to ease the administration of medications (*n* = 37/408, 9.1%). There were 60% of participants prescribed a minimum of four medications (*n* = 241/408) with the remaining 40% (*n* = 167/408) requiring a more complex treatment regimen (more than five medications). Patient demographic and characteristics data are shown in Table 1.

Table 1: Patient demographic and characteristics.

Total number of subjects recruited	***n* = 408** ***n* (%)**
Gender	
Female	220 (53.9)
Male	188 (46.1)
Age (years old)	
31–45	49 (12.0)
45–60	169 (41.4)
≥ 61	190 (46.6)
mean ± SD	58.2 ± 10.3
Ethnicity	
Chinese	101 (24.8)
Indian	98 (24.0)
Malay	205 (50.2)
Others	4 (1.0)
Education level	
No education	21 (5.1)
Primary	94 (23.0)
Secondary	225 (55.1)
Tertiary	68 (16.7)
Working status	
Not working	260 (63.7)
Working	148 (36.3)
Living status	
Alone	18 (4.4)
Family	388 (95.1)
Friends	2 (0.5)
Marital status	
Married	320 (78.4)
Single	29 (7.1)
Widowed	54 (13.2
Divorced	5 (1.2)
Administration of medications	
Self	371 (90.9)
Caregiver	37 (9.1)

(*continued on next page*)

Table 1: (*continued*)

Total number of subjects recruited	***n* = 408** ***n* (%)**
Mean number of medications prescribed ± SD	5.4 ± 2.0
Medication aids	
None	309 (75.7)
Pillbox	99 (24.3)

Note: SD = standard deviation

MEDICATION KNOWLEDGE

Amongst the 408 participants recruited in the study, 24.8% (*n* = 101/408) had issues with medication indication; 15.2% (*n* = 62/408) had issues with medication dose; 8.6% (*n* = 35/408) had issues with the frequency of medication; 2.0% (*n* = 8/408) did not know the proper storage conditions of their medication; and 15.4% (*n* = 62/408) had issues with medication administration. Subsequently, at the follow-up visit, the percentage of participants who were able to verbalise the correct indication, dose, frequency, storage condition and administration of their medications improved by 21.1%, 12.3%, 4.2%, 9.0% and 2.0%, respectively, after medication review (Figure 1).

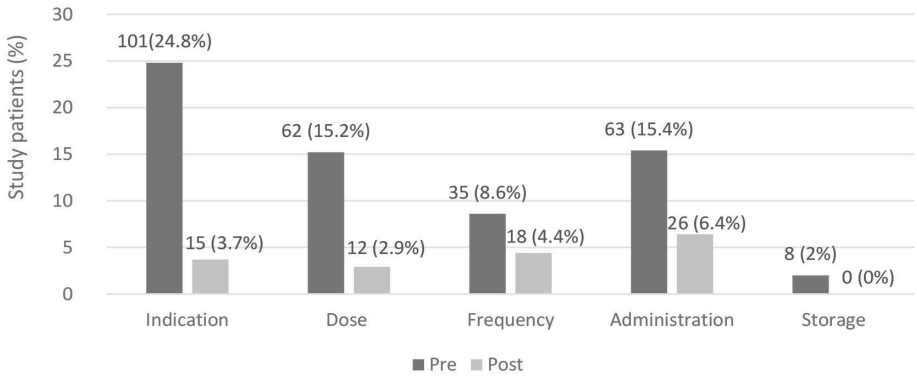

Figure 1: Knowledge deficiency in medication knowledge five indices in *n* = 408 participants.

At baseline, elderly participants (≥ 61 years old) were found to have a lower medication knowledge (*n* = 163/408, 40%) compared to non-elderly participants (*n* = 189/408, 44.1%). Following the follow-up visit, elderly participants (≥ 61 years old) had shown improvement in medication knowledge after the medication review with a 4.6% increment (Table 2). Meanwhile, younger participants showed an improvement in medication knowledge of 7.4% after the medication review. In this study, it was found that the younger participants (< 61 years old) were generally better educated ($p < 0.001$). It was also shown in Table 2 that participants with at least secondary education levels had higher improvement (9.5% increment) in medication knowledge compared to lower education levels.

Table 2: Number of participants with total medication knowledge score of 1 (correctly verbalised all answers in five knowledge indices) pre- and post-medication review in different age group and education status.

Demographic	Number of participants with medication knowledge score of 1, *n* (%)	
	Pre-	**Post-**
Age group		
< 61 years old	180 (44.1)	210 (51.5)
≥ 61 years old	163 (40.0)	182 (44.6)
Education status		
No education	16 (3.9)	20 (4.9)
Primary	82 (19.9)	92 (22.5)
Secondary	188 (46.1)	215 (52.7)
Tertiary	53 (13.0)	65 (15.9)

Medication Adherence

Table 3 in this study showed that at baseline, 43% of participants were adherent to their medications. After medication review, an improvement of adherence by 43.2% to 72.5% was noted (29.3% increment). Meanwhile, a decrease of 23.3% was also noted from the non-adherent group post-medication review. Furthermore, from Table 4 provided, it was shown that three-fifths of participants (*n* = 249/408, 61%) claimed to have never forgotten to consume their medicine in the past one-month post-medication review, which is an improvement of 20% from pre-medication review scores. Additionally, Table 4 also showed overall mean scores improvement from pre- and post-medication review (higher mean score than baseline) especially on both unintentional (Question 1 and 6) and intentional missed/skipped dose (Question 2, 3, 4, 5 and 7).

Table 3: Medication adherence distribution at pre- and post-medication review.

Adherence score	Adherence status	Pre- *n* (%)	Post- *n* (%)
28	Adherer	86 (21.1)	196 (48.0)
27 (one point deducted from either question 1 or 6)	Adherer	90 (22.1)	100 (24.5)
27 (one point deducted due to other question)	Non-adherers	31 (7.6)	28 (6.9)
23–26	Non-adherers	179 (43.9)	80 (19.6)
7–22	Non-adherers	22 (5.4)	4 (0.1)

Notes: Adherers were those that scored a full score of 28 or a score of 27 (due to only one point deducted from Question 1 or Question 6), as described in the method section.

Table 4: Adherence scores pre and post-medication review.

Questions	Adherence score, *n* (%)								Mean score	
	Pre-medication review				Post-medication review				Pre-	Post-
	1	2	3	4	1	2	3	4		
1. How often do you forget to take your medicine?	1 (0.2)	14 (3.4)	223 (54.7)	170 (41.7)	0 (0.0)	2 (0.5)	157 (38.5)	249 (61.0)	3.38	3.61
2. How often do you decide not to take your medicine?	3 (0.7)	0 (0.0)	100 (24.5)	305 (74.8)	2 (0.5)	0 (0.0)	32 (7.8)	374 (91.7)	3.73	3.91
3. How often do you miss taking your medicine because you feel better?	1 (0.2)	4 (1.0)	64 (15.7)	339 (83.1)	0 (0.0)	2 (0.5)	24 (5.9)	382 (93.6)	3.82	3.93
4. How often do you decide to take less of your medicine?	2 (0.5)	9 (2.2)	87 (21.3)	310 (76.0)	0 (0.0)	2 (0.5)	30 (7.4)	376 (92.2)	3.73	3.92
5. How often do you stop taking your medicine because you feel sick due to the effects of the medicine?	3 (0.7)	1 (0.2)	53 (13.0)	351 (86.0)	0 (0.0)	4 (1.0)	19 (4.7)	385 (94.9)	3.84	3.92
6. How often do you forget to bring along your medicine when you travel away from home?	0 (0.0)	2 (0.5)	60 (14.7)	346 (84.8)	0 (0.0)	0 (0.0)	28 (6.9)	380 (93.1)	3.84	3.93
7. How often do you not take your medicine because you run out of them at home?	1 (0.2)	2 (0.5)	103 (25.2)	302 (74.0)	0 (0.0)	0 (0.0)	50 (12.3)	358 (87.7)	3.73	3.88

Note: Adherence scores scales: 4 = none of the time; 3 = some of the time; 2 = most of the time; 1 = all of the time.

Improvement of medication adherence before and after medication review especially in non-elderly with 3.5% increment, and working participants with 2.5% increment (Table 5). This study also found that different age groups (elderly versus non-elderly) and working status (working and non-working) appeared to have a significant association towards medication adherence ($p < 0.001$).

Table 5: Improvement in participants' adherence pre- and post-medication review.

Demographic	Number of adherent participant, *n* (%)		*p*-value
	Pre-	Post-	
Age			
< 61 years old	220 (53.9)	234 (57.4)	< 0.001[a]
≥ 61 years old	166 (40.7)	170 (41.7)	
Working status			
Not working	250 (61.3)	258 (63.2)	< 0.001[b]
Working	136 (33.3)	146 (35.8)	

Notes: [a]*p*-value based on McNemar test with binomial distribution used. Two cells (50%) have expected count less than 5. The minimum expected count is 1.69; [b]*p*-value based on McNemar test with binomial distribution used. Two cells (50%) have expected count less than 5. The minimum expected count is 1.45.

Correlation Between Medication Knowledge and Adherence

A paired *t*-test was run to predict the association between participants' medication knowledge and adherence. Based on Table 6, there is a significant association between medication knowledge and adherence ($p < 0.001$).

Table 6: Correlation between participants' medication knowledge and adherence.

Mean (SD)	SD	Standard error mean	95% Confidence interval difference	*t*-stats (df)	*p*-value
2.8533	0.3224	0.160	2.8220, 2.8847	178.77 (407)	0.000

DISCUSSION

From the analysis, it was found that most elderly patients (≥ 61 years old) have an issue with medication knowledge and adherence. Elderly patients in the study are shown to have a low baseline level of knowledge and adherence during pre-medication review and significant improvement ($p < 0.001$) can be seen after the medication review (Table 5). Other studies also show that elderly patients are the ones who benefited most from medication review (Lowe *et al*. 2000; Conn *et al.* 2009; Goh *et al*. 2014; Awwad *et al*. 2015). Therefore, elderly patients should be enrolled for medication review regardless of the number of medications they are taking, as well as elderly patients with other probable contributing factors affecting adherence (Tsai *et al*. 2012; Smaje *et al*. 2018). The cognitive and memory function diminishes as age increases; thus, elderly patients have trouble processing information given during dispensing at the counter. This can be further worsened when they are also having difficulty in reading the medication label due to vision impairment. Furthermore, a lack of understanding of medication labels despite the written information regarding the indication, dosage and frequency on the labels might require the presence of a caregiver for some patients (Insel *et al*. 2006; Shruthi *et al*. 2016). A medication review can help patients to see the overall picture of their medication regimen, and improve medication understanding by simplifying their medication regimen. This includes advise on medication

administration by suggesting various methods to aid compliance such as preparation of pillbox, setting an alarm or sticky note as a reminder, and getting help from family members and friends to remind them to avoid missing medication dose.

Intentional non-adherence can be due to the lack of knowledge and understanding of their medication importance (Awwad *et al*. 2015). Some patients, including younger patients, would only consume their medications when they deemed necessary, usually after they have felt the symptoms, or only after allaying the aversion to continue taking their medication (Awwad *et al*. 2015; Kvarnström, Airaksinen and Liira 2018). Another intentional non-adherence can be contributed to by false beliefs and myths regarding the medication regimen (Molloy *et al*. 2014). Patients' beliefs and attitudes demonstrate their intentions to follow their medication regimen. Intending or readiness to adhere is essential to following treatment advise (Willey *et al*. 2000). Therefore, revising patients' beliefs according to evidence-based facts during medication counselling and review could help to achieve therapeutic goals and avoid further comorbidities.

The power of the sample size obtained was sufficient to demonstrate that patients with higher education levels have higher medication knowledge levels and achieved more improvement compared to lower education levels ($p < 0.001$). This can be found in other studies as well that investigate education level factors in patient's medication knowledge (Ponnusankar *et al*. 2004; Alkatheri and Albekairy 2013; Awwad *et al.* 2015; Najjar *et al*. 2015; Shruthi *et al*. 2016; Gast and Mathes 2019; Mekonnen and Gelayee 2020). This can be attributable to the higher awareness among them, resulting in their effort to understand their medication regimen and develop a better understanding regarding their medication, instruction, and advice. Those patients with lower-level education that may have difficulty in understanding instruction will benefit from a medication review. Moreover, it is also found in the study that some of the working patients showed a lower adherence rate compared to non-working patients (Table 5). This may be due to patients' inability to incorporate medication administration into their working schedule and lifestyle, and not motivated in complying to their medication regime. These patients can benefit from medication review by detecting the issues that hinder them from adhering to their medication, tailoring interventions to the unique characteristics and lifestyle of patients, and help by discussing solutions for them.

From the 'other information related to participant's medication knowledge' part of the questionnaire conducted in this study, it was found that discussion with doctors may contribute to improving patients' medication knowledge although it is not significant ($p = 0.387$). This lack of significance may be because a medication review session performed by the pharmacist allows sufficient time to conduct proper medication counselling. It can also be due to the presence of physical medication that helps patients better visualise and understand their medication while doctors help by improving understanding of the disease process to patients. This was shown in few studies where doctors that solely conducted the medication review realised the need for pharmacist involvement in detecting all issues pertaining to patients' medication regimen (Kvarnström, Airaksinen and Liira 2018; Duncan *et al*. 2019). This further indicates the need for effective collaboration between doctors and pharmacists to achieve the full benefit of medication review. An improvement in collaboration between prescribers and pharmacists may offer greater benefits in the future particularly for the implementation of medication review through a joined-up service. This further indicates the need for effective collaboration between doctors and pharmacists has a positive impact on patient outcomes and achieves the full benefit of medication review.

LIMITATION AND FUTURE RESEARCH

One of the limitations of this study is the short duration of follow-up (one month). While this preliminary study on pharmacist-led medication review in primary health care facilities can be the baseline for future studies, a further study demonstrating the effectiveness of medication review in cultivating knowledge retention and sustained adherence in the longer-term is warranted. The second limitation is that the Malaysian Pharmaceutical Division of the Ministry of Health Malaysia has recently endorsed the Malaysian medication adherence assessment tool (MyMAAT) as the latest validated tool to measure medication adherence. Future research may benefit from the updated medication adherence assessment tool to obtain precise results. Future work shall also focus on measuring the cost-effectiveness of pharmacist-led medication review implementation in primary healthcare settings.

CONCLUSION

A 29.3% improvement in adherence rate among 408 patients one month after medication reviews were conducted showed that medication reviews conducted by pharmacists were able to improve patients' medication knowledge and adherence. A pharmacist-led medication review is essential and can be an effective service in the primary health care facilities for patients to enhance their knowledge on their medications, and adherence especially in elderly patients on chronic medications.

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