




Original Research

Medication adherence among hemodialysis patients: the impact of pharmacist-led motivational interviewing

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Abstract

Background: Significant proportion of haemodialysis (HD) patients fails to comply with their prescribed medication regimens, leading to poor health outcomes and survival rates. This highlights the need for interventions that improve medication adherence thereby leading to improved patient outcomes. **Objectives:** To evaluate the impact of motivational interviewing, a skilful clinical method to improve medication adherence among HD patients. **Methods:** A pre-post study was conducted prospectively among 63 HD patients at multicentre dialysis units. The recruited patients received three sessions of MI which helps in addressing patient beliefs around medication and overcome barriers for nonadherence. General medication adherence scale (GMAS) was used to evaluate the medication adherence among enrolled patients. An independent t-test was used to analyze the impact of MI in improving adherence among HD patients. In this study, the level of significance was 0.05. **Results:** A total of 63 patients (27 males and 36 females; mean age 48.5±13.9 years) were included in the study. While the mean of dialysis duration and number of medications was 7.7±6.0 years and 8.1±2.2 respectively. Paired t-test showed a significant increase in medication adherence score from a baseline for nonadherence domain of patient's attitude and nonadherence domain of additional illness and pill overload at the end of the study ($p<0.05$). However, the non-adherence domain of financial constraints, was not statistically significant, $p=0.507$. Motivational interviewing was effective in increasing intrinsic positive attitude by resolving their ambivalence thus improving the adherence towards medication. **Conclusion:** This study emphasized that MI conducted by pharmacist effectively improves HD patients' medication adherence. Healthcare professionals ought to employ this strategy in order to assist HD patients in better taking their medications.

Keywords: pharmacists; motivational interviewing; hemodialysis; adherence; medication

INTRODUCTION

End stage renal disease (ESRD) has become a global concern where nearly 4 million people worldwide are on renal replacement therapy with accounting for 89% of all dialysis.¹ A forecasting study estimated that the prevalence of ESRD patients in Malaysia receiving dialysis treatment in year 2040 would be 106249 patients with the estimated treatment costs of \$797 million, which the average cost per patient is MYR 30000.² Despite advancements in medical treatment, one of the most critical aspects of managing ESRD is medication adherence, which refers to a patient's degree of compliance with the prescribed medication dosing regimen, encompassing factors such as timing, dosage, and intervals between doses.³

Due to the complexity of individual regimens, which require the administration of various doses, forms, and frequency, maintaining continuous adherence is a major challenge among HD patient.⁴ Studies shown that an average prevalence rate of 52.5% medication non-adherence was reported among HD patients.⁵ This shows medication adherence among ESRD patients remains a challenge.⁶ The study found that only 54.3% of ESRD patients adhered to their medication regimen. There were various factors reported in contributing to non-adherence among HD patients such as, younger age, forgetfulness, financial barriers, and complexity of medication regimens.^{7,8}

Furthermore, patient's beliefs about their medications is another barrier for adherence in dialysis patients.⁹ Patient who did not see any improvement of his health condition was found to be non-adherent towards medication.¹⁰ Interpersonal dynamics of health care and the patient also plays an important role in patient adherence to their treatment recommendations as with motivated and empathetic communication with physician improves adherence.¹¹ Non-adherence to medication regimens can result in negative health outcomes, such as increased hospitalizations and mortality rates. This contributes to the cost of treating complications from medication nonadherence increase to an average about \$100 billion a year.¹⁰

Motivational interviewing (MI) is a method supported by evidence that aims to change behaviour by boosting intrinsic motivation and self-efficacy.¹² Given their expertise in medication management and patient education, pharmacists have an important role to play in addressing this issue medication adherence issue among HD patients. Pharmacist-

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led MI has previously been shown to improve medication adherence in a variety of patient populations, including chronically ill patients. However, there is a dearth of research on pharmacist intervention's efficacy, particularly with haemodialysis patients. As far as our understanding goes, the Malaysian healthcare system does not currently employ this type of intervention.

Thus, this study aims to fill this research gap by examining evaluate the impact of motivational interviewing, a novel skilful clinical method to maintain behavioural change and support treatment adherence among HD patients in Malaysia.

METHODS

Study design

A pre-post study was conducted prospectively among HD patients at the Hemodialysis Unit, Hospital Kuala Lumpur (HKL), and the Hemodialysis Affiliated Centers of the University Malaya Medical Centre (UMMC). The selected HD patients were followed for a period of 12 months.

Sample size

The sample size for this current study was calculated using the power and size calculation version 3.1 software. The estimated sample size using a power of 0.95 and 95% confidence interval was 56 patients.

$$n \geq \frac{Z_{\alpha/2} + Z_{\beta}}{ES}^2$$

n= sample size

Z= statistic for level of confidence, using a 95% confidence interval (so Z=1.96)

α = 0.05

β = type II error

ES = Effect size, δ / σ

δ = A difference in population means

σ = Standard deviation of difference in the response of matched pairs

Therefore, by using value of $\delta = 0.9$ and $\sigma = 1.84$ from similar previous study on chronic illness patient.¹³

n = 56

Study of a continuous response variable from matched pairs of study subjects. Prior data indicate that the difference in the response of matched pairs is normally distributed with standard deviation 1.84. If the true difference in the mean response of matched pairs is 0.9, we will need to study 56 pairs of subjects to be able to reject the null hypothesis that this response difference is zero with probability (power) 0.95. The Type I error probability associated with this test of this null

hypothesis is 0.05.

$\approx 56 \pm 25\%$ * (to compensate for drop off or incomplete data)

≈ 70 respondents

Considering the dropout rate of 25%*, 14 patients were added; therefore, a total of 70 patients were required in the study.

Participants

All ESRD patients aged 18 years or over undergoing HD treatment (thrice a week) for at least 3 months, and able to communicate in English or Malay, were included in the study. While patients who have had any major surgical interventions in the previous three months, or have malignancies, cognitive impairment, dementia, active psychosis, or major hearing impairment, or are pregnant or breastfeeding, were excluded.

Patient selection

A complete list of active ESRD patients undergoing HD continuously was obtained from the head of dialysis unit centres. A simple random sampling technique with a research randomizer, an online tool, was used to recruit potential patients. The list of all HD patients was entered into the research randomizer to generate random numbers to assign to patients for selection. Once all potential patients were selected, a written, informed consent was taken from the patients prior to study initiation. All demographic data of the selected patients such as age, gender, past medical & medication history, dialysis history, medications prescribed (name, dose, frequency, route, duration of the drug) were obtained from electronic health records.

Interventions

This current study implements patient centered pharmacist care using a novel MI approach. Motivational interviewing is an interactive counseling style in which patients are engaged in the process of thinking and talking about their medication-taking behavior.¹⁴ This novel intervention was used to empower patients with necessary information about their diseases, to address their beliefs around medication, to overcome barriers for nonadherence as well as to provide specific instruction to optimize the use of each medication on an individual basis.¹⁵ It assists individuals in exploring and resolving ambivalence regarding change by utilizing a specific set of techniques to mobilize their own intrinsic values and goals.¹² This approach consists of the aforementioned four domains that was used in the current study: providing information about diseases, addressing beliefs on medication, overcoming barriers for nonadherence, and providing specific instructions to optimize the use of each medication. These domains are aligned to the MI principles and strategies described by Miller & Rollnick.¹⁶

Motivational interview training

Motivational interviewing is a skill which needs guidance from a certified trainer. Therefore, the researcher who was a pharmacist attended MI training before initiation of the study. The training was given by a certified professional counsellor



from the Centre for Counselling Services at Taylors University. The training for MI includes reading materials, viewing video demonstrations related to MI, and attending discussions with the counselor. At the end of the training session, the pharmacist who was the researcher was equipped with essential skills to engage with the patients and feel more confident to approach and conduct MI.

Data collection procedure

Motivational interviewing was conducted at month-3 and continued on the month-6 and month-9. Each session was approximately 15 to 20 minutes for each patient. Only the first session was conducted via face to face (during the patients scheduled dialysis day) to build a good relationship with the patient. While the second and third session was conducted via telephone call. The call was held at a time when the patient was free, which gives them more time to consider the reasons for the habitual change. This mindset is impossible to adopt during HD sessions due to fatigue and the noisy environment. This method has proven its efficacy from previous research.¹⁷ and ensure safety for both the patients as well as the researcher. Three sessions were chosen to motivate and improve their medication taking behavior.

Outcome measure

This current study measures the level of adherences among recruited HD patients using *General Medication Adherence Scale (GMAS)* scale. A novel GMAS tool was used to measure the adherence. Patients answered 11 questions and were graded out of a score of 33. Each question was assessed using a 4-point Likert scale, ranging from "Never" to Always" where each answer was given a specific point such as "Never=3, "Sometimes=2", "Mostly=1", "Always=0". Grading for cumulative medication adherence was described as; score between 30 and 33 was considered as high adherence, good adherence was considered for a score between 27 and 29, partial adherence was considered if final score is between 17 and 26, low adherence was considered for patients having a score between 11 and 16. Patients whose final score was between 0 and 10 would be classified as poorly adherent. The GMAS measured adherence across three domains namely non-adherence due to patient behavior, comorbidity and pill burden related non-adherence and cost-related non-adherence. Questions 1 till 5 measures "Nonadherence due to patient attitude", Questions 6 till 9 measures 'Nonadherence due to additional illness and pill overload" and finally Questions 10 and 11 measures "Nonadherence due to financial constraints. This adherence tool has been validated to measure medication adherence among chronically ill patients.¹⁸

Intervention timeline

The patients' adherences scale was collected twice during the study period. The first adherence record collected at baseline before the MI was conducted by the researcher and the final adherence record collected at the final study period which was after the three sessions of MI. Collected details were then compared with the baseline and analyzed to detect for any significant changes. Table 1 shows the summary of the activity.

ACTIVITY	MONTH				
	0	3	6	9	12
Patient recruitment	/				
Patient demographic details collection	/				
Motivation interview		/	/	/	
Assess adherence using GMAS	/				/

Statistical analysis

Continuous variables were normally distributed and were expressed as mean \pm standard deviation while categorical variables were expressed as a percentage. Further the data was analyzed to determine any associated factors between medication adherence scores collected at baseline and GMAS domains namely - Nonadherence due to patient attitude, Nonadherence due to additional illness and pill overload and Nonadherence due to financial constraints. Data was analyzed using SPSS Version 26.0 (IBM Corp., Armonk, New York, USA). The significant level was set at $p < 0.05$. Independent t-test for two groups and ANOVA test for more than two groups were performed for each numerical domain. Adherence patterns before and after intervention was assessed using paired sample t-tests.

RESULTS

Demographic details of the recruited HD patients

At first, the study included approximately 71 patients. However, the study was only completed by 63 patients. Due to patient transfers ($n = 2$) and deaths ($n = 6$) during the study period, the data from eight patients were not included in the analysis. The mean age of recruited patients were 48.5 to 13.9 years. Majority were women 36 (57.1%) and about 51(81%) of the patients were married. Despite the fact that 57 (90.5%) of patients took more than five different kinds of medication, the average number of medications was 8.1 ± 2.2 . The average duration of dialysis was 7.7 ± 6.0 years. The majority of the HD patients had fewer than three comorbidities 41(65.1), while approximately one third had three or more. While most frequently mentioned comorbidities were diabetes mellitus 20(18.7), hyperlipidemia 12(11.2), and hypertension 39(36.5) (Table 2).

Table 3 shows that only 11 (17.5%) of the patients had a high adherence score while 27 (42.9%) of the patients had a good adherence score and 25 (39.7%) of the patients had a partial adherence score. There were no patients with low and poor adherence scores.

Factors associated with medication adherence score among the recruited HD patients at the baseline with GMAS domains

For the non-compliance due to patient attitude, number of medication patients was taking shows statistically significant. Patient taking less than 5 medications had statistically significant higher adherence score (13.0 ± 1.5) compared to



Table 2. Socio and clinical demographic characteristics of patients recruited (n =63)

Characteristic	n (%)	Mean(±SD)
Age		48.5±13.9
< 65	54(85.7)	
≥ 65	9(14.3)	
Gender		
Male	27(42.9)	
Female	36(57.1)	
Marital status		
Single	12(19.0)	
Married	51(81.0)	
No of medications		8.1±2.2
< 5	6(9.5)	
≥5	57(90.5)	
Duration of dialysis		7.7±6.0
<5	32(50.8)	
≥5	31(49.2)	
Types of comorbidities		
Hypertension	39(36.5)	
Diabetes mellitus	20(18.7)	
Hyperlipidemia	12(11.2)	
Ischemic heart disease	12(11.2)	
Others	24(22.4)	
No of comorbidities		2.2±1.3
<3	41(65.1)	
≥3	22(34.9)	

Table 3. Classification of medication adherence score among the recruited HD patients at the baseline

Classification of GMAS score	n(%)
High adherence (Score between 30 and 33)	11(17.5)
Good adherence (Score between 27 and 29)	27(42.9)
Partial adherence (Score between 17 and 26)	25(39.7)
Low adherence (Score between 11 and 16)	0(0)
Poor adherence (Score between 0 and 10)	0(0)

patient taking more than 5 medications (11.3±1.6), p=0.016. Moreover, for the Nonadherence due to financial constraints, marital status shows statistically significant. Married patients have higher adherence score (5.5±0.7) compared to unmarried patients (4.5±1.7), p=0.007. On the other hand, there was not any factors associated with the score in Nonadherence due to additional illness and pill overload domain. Table 4 compares recruited patients demographic and clinical factors with subscales of GMAS score at baseline.

Medication adherence score among the recruited HD patients at the end of the study

From the Table 5, it was reported that more than half, 36(57.1%) of the recruited patients have high medication adherence after

Table 4. Comparing recruited patients demographic and clinical factors with subscales of GMAS score at baseline

Characteristic	n(%)	Nonadherence due to patient attitude	P-value	Nonadherence due to additional illness and pill overload	P-value	Nonadherence due to financial constraints	P-value
Age			0.476		0.403		0.963
18–40	19(30.2)	11.3±2.1		10.0±1.9		5.10±1.5	
41–64	34(54.0)	11.4±1.3		10.1±1.1		5.47±0.7	
≥ 65	10(15.9)	12.0±1.4		9.40±1.0		5.30±1.2	
Gender			0.655		0.960		0.818
Male	27(42.9)	11.6±1.7		9.9±1.5		5.2±0.9	
Female	36(57.1)	11.4±1.6		9.9±1.3		5.3±1.2	
Ethnicity			0.790		0.524		0.192
Malay	34(54.0)	11.4±1.6		10.1±1.6		5.5±0.8	
Non-Malay	29(46.0)	11.5±1.5		9.8±1.1		5.1±1.3	
Marital status			0.710		0.725		0.007*
Single	12(19)	11.3±1.9		10.1±1.8		4.5±1.7	
Married	51(81)	11.5±1.5		9.9±1.3		5.5±0.7	
Employment			0.163		0.170		0.219
Yes	16(25.4)	11.1±1.8		10.3±1.6		5.6±0.6	
No	47(74.6)	11.6±1.5		9.8±1.3		5.2±1.2	
Smoking			0.988		0.489		0.568
Yes	8(12.7)	11.5±1.8		9.6±1.9		5.1±0.9	
No	55(87.3)	11.4±1.6		10.0±1.3		5.3±1.1	
Alcoholic			0.359		0.461		0.543
Yes	1(1.6)	10.0		11.0		6.0	
No	62(98.4)	11.5±1.6		9.9±1.4		5.3±1.1	
No of medications			0.016*		0.197		1.00
< 5	6(9.5)	13.0±1.5		10.6±1.0		5.3±1.2	
≥5	57(90.5)	11.3±1.6		9.8±1.4		5.3±1.1	



Duration of dialysis			0.203		0.131		0.595
<5	32(50.8)	11.7±1.6		10.2±1.0		5.4±1.2	
≥5	31(49.2)	11.2±1.6		9.6±1.7		5.2±0.9	
No of comorbidities			0.978		0.847		0.577
<3	41(65.1)	11.5±1.7		9.9±1.6		5.3±1.1	
≥3	22(34.9)	11.5±1.4		10.0±1.0		5.2±1.0	

Table 5. Classification of medication adherence score among the recruited HD patients at the of the study

Classification of GMAS score	n (%)
High adherence (Score between 30 and 33)	36(57.1)
Good adherence (Score between 27 and 29)	17(27.0)
Partial adherence (Score between 17 and 26)	9(14.3)
Low adherence (Score between 11 and 16)	1(1.6)
Poor adherence (Score between 0 and 10)	0(0)

the MI intervention sessions. While number of patients having medication adherence at the level of good and partial reduced by 10 and 16 respectively compared to baseline as they move towards having high adherence category. On the other hand, only one patient declined adherence to low level, 1(1.6%).

Comparison of pre and post medication adherence score among the recruited HD patients

Medication adherence score obtained from this study was classified as pre-score which indicated before intervention and post-score which indicated after the intervention by the researcher. Based on the Table 6, for the domain Nonadherence due to patient attitude, the sample mean before the intervention was 11.4±1.6 and sample mean after the intervention was 12.7±1.8. The p value is less than 0.05 which indicates the change in mean score was statistically significant. We are 95% confident the mean improve in adherence among HD patients is between -1.75 and -0.75.

While for the noncompliance due to additional illness and pill overload, the sample mean before the intervention was 9.9±1.4 and sample mean after the intervention was 11.0±1.5. The p value is less than 0.05 which indicates the change in mean score was statistically significant. We are 95% confident the mean improve in adherence among HD patients is between -1.52 and -0.61. However, the non-compliance due to financial

constraints, it was reported mean score changes from 5.3±1.1 to 5.4±1.0, however it was not statistically significant, $p>0.05$. These findings suggest that the intervention implemented in the study may have had a positive impact on improving medication adherence among HD patients, particularly in the domains of nonadherence due to patient attitude and additional illness and pill overload.

DISCUSSION

The mean age among our study population was 48.5 years. This was similar to an article by Dian et al., 2020 which reports that 70.6% HD patients were aged below than 60 years of age. It can be seen that, as years increase more younger patient tend to have chronic kidney disease.¹⁹ Based on the 24th Report of The Malaysian Dialysis & Transplant Registry (2016), more than 80% of new patients were in the age group of 45 years or older.

The female patient's predominance was seen in this study population. This was slightly different from other reported studies which shows majority were from male gender.²⁰ However, worldwide, the proportion of women receiving HD is rising.²¹ Women's unwillingness to seek medical attention may be one of the causes.²² Patients on HD consumes a lot of pills due to their many comorbidities as well as complications from their disease state, which makes their care more complicated.²³

As a result, they are more likely to develop MRPs, which can lead to medication nonadherence.²⁴ As adherence was the largest barrier identified and the most challenging to overcome among HD patients, MI techniques used in this study with positive reinforcement enabled to determine the root cause of nonadherence among the recruited HD patients. This study reports the adherence using the GMAS scale. This adds uniqueness to our study because previous reported studies based on a systematic review uses other types of adherence tools such as Medication Adherence Report Scale (MARS), Brief Medication Questionnaire (BMQ) and Morisky 8-item Medication Adherence Scale (MMAS-8).^{5,25}

In this study, before the pharmacist intervention, only 17.5% of the recruited HD patients have high adherence. According to a

Table 6. Comparison of pre and post medication adherence score among the recruited HD patients

Domains	Pre-score (Before intervention) Mean (SD)	Post-score (Post intervention) Mean (SD)	P-value
Nonadherence due to patient attitude	11.4±1.6	12.7±1.8	<0.05
Nonadherence due to additional illness and pill overload	9.9±1.4	11.0±1.5	<0.05
Nonadherence due to financial constraints	5.3±1.1	5.4±1.0	0.507



study, low treatment adherence is a widespread problem with significant clinical relevance among dialysis patients.²⁶ Results from the statistical analysis to identify factors that affect the baseline adherence score, showed that there was a statistically significant difference in non-compliance due to patient attitude with number of medications. It can be seen that, mean score of patients taking less than 5 medications were more likely to adhere to their medications than patients taking more than 5 medications. Few previous studies reported the similar findings where high number of tablets count per day with different frequency and dosing schedule will add complexity to the medication regime. This causes low medication taking behavior among HD patients.²⁷ Moreover, for the noncompliance due to financial constraints, marital HD patients have statistically significant higher adherence score compared to unmarried HD patients. Study done by Sheikh and colleagues among 191 HD patients, also reported significant difference in medication adherence was higher in married HD patients compared to single or other groups (divorced/widow/partner death).²⁸ In addition, there is evidence showing, close family members support promoted for improved patient adherence.²⁹

After the pharmacist intervention in providing MI, the post adherence score shows more than half, 57.1% of the recruited patients having high medication adherence at the end of the study. A systematic review shows 17 published papers proves improvement in medication adherence in the MI intervention group by the pharmacist.¹⁵

Furthermore, another recently published systematic review assessing the efficacy of MI to support medication adherence in adults with chronic conditions also shows 23 out of 54 papers, medication adherence was significantly improved after pharmacist intervention through MI.³⁰ However, both systematic reviews were conducted on patients on in cardiovascular diseases, psychiatry, HIV, endocrinology and none on HD patients. Therefore, this study supports that medication adherence among HD patients can be improved by pharmacist conducted MI.

On the whole, paired t-test showed a significant difference noncompliance due to patient attitude and also noncompliance due to additional illness and pill overload domains after the pharmacist conducted MI sessions among recruited HD patients. Erroneous medication beliefs were found to be a significant contributor to medication nonadherence among HD patients, as HD patients can form their own implicit beliefs about medications, which can result in intentional medication nonadherence.³¹ So, the findings of this study demonstrate that the novel MI skills by a pharmacist are effective at increasing the intrinsic motivation of patients, which in turn causes positive medication belief and behavior, thereby improving patients' adherence to treatment.

Limitations

The study has some limitation where it was subjected to small sample size and only done in few Malaysia dialysis unit, thus generalizing the findings of this study is not favored. Moreover,

patient adherence was measured through self-administered questionnaires, which may be subject to recall and social-desirability bias. In addition, there was no standardized communication method between pharmacists and physicians in the dialysis unit, leading to some recommendations being overlooked by physicians.

Strengths

In spite of pandemic situation, this study still has shown improvement in mean scores of QOL and adherence after the pharmacist led intervention by MR and MI. This is the case despite the fact that some of the outcomes were not statistically significant, this study proves that the entire process of conducting a comprehensive interview utilizing concepts of MR and MI had a significant clinical impact on optimizing medication regimen in a patient-centred approach, and as a result, will improve adherence and QOL, consequently, clinical outcomes. Future studies should focus in conducting a cost benefit analysis to prove that having pharmacist led intervention via MI in healthcare team is clinically beneficial.

CONCLUSION

Present study supports that pharmacist intervention using MI technique, which acts as a patient-centered approach manage to change behaviour, increase belief and intrinsic motivation towards medication adherence. This shows pharmacists' contribution to pharmaceutical care and illustrates the importance of having clinical pharmacists as interdisciplinary team members in dialysis care. Therefore, this current study recommends dialysis unit directors, clinicians, and hospitals administrators to start indicating the need to have pharmacist-based pharmaceutical care among HD patients.

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AUTHOR(S) ROLE

GSP and RAA have drafted the first version of the manuscript. All authors have been involved in all stages of the study. RGS and LKCK were involved in conceptualization of the study. GSP was involved in data extraction whereas LKCK and RAA overlooked the process. Data can be accessed by all the authors throughout and after the study; GSP: Methodology, data collection, supervision, final drafting; RAA: Supervision, resources, data analysis; RGS: Conceptualization, content validation, reviewing; LKCK: Conceptualization, content validation, reviewing



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