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Influence of Pharmacist-Conducted Motivational Interviewing on Medication Adherence in Hemodialysis Patients

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ABSTRACT

A considerable number of patients undergoing haemodialysis (HD) do not follow their prescribed medication schedules, resulting in adverse health consequences and reduced survival probabilities. This underscores the importance of developing strategies to enhance medication compliance and consequently improve patient outcomes. To assess the effectiveness of motivational interviewing as an advanced counselling technique in enhancing medication adherence in HD patients. A prospective pre-post design study was carried out involving 63 HD patients across multiple dialysis centres. Participants underwent three motivational interviewing (MI) sessions aimed at exploring their perceptions regarding medications and tackling obstacles to adherence. Medication adherence was measured using the General Medication Adherence Scale (GMAS). The effect of MI on adherence improvement was examined with an independent t-test, setting the significance level at 0.05. The study enrolled 63 patients (27 men and 36 women; average age 48.5 ± 13.9 years). The average duration on dialysis was 7.7 ± 6.0 years, and the mean number of prescribed medications was 8.1 ± 2.2. Results from the paired t-test indicated a notable rise in adherence scores from baseline in the domains related to patient attitudes toward non-adherence and the burden of additional illnesses combined with pill load by the study's conclusion ($p < 0.05$). In contrast, the domain concerning financial barriers showed no significant change ($p = 0.507$). MI proved successful in fostering a more positive internal mindset by addressing patients' conflicting feelings, thereby promoting better medication compliance. The findings demonstrate that pharmacist-delivered motivational interviewing significantly enhances medication adherence in HD patients. It is recommended that healthcare providers adopt this approach to better support HD patients in managing their medication regimens.

Keywords: Pharmacists, Motivational interviewing, Hemodialysis, Adherence, Medication

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Introduction

End-stage renal disease (ESRD) represents a major worldwide health issue, with approximately 4 million individuals globally receiving renal replacement therapy, of which 89% involves dialysis [1]. Projections suggest that by 2040, the number of dialysis-treated ESRD patients in Malaysia could reach 106,249, with projected treatment expenses totaling $797 million and an average per-patient cost of MYR 30,000 [2]. Even with progress in therapeutic options, medication adherence—defined as the extent to which patients follow the recommended schedule for dose, timing, and frequency—remains essential for ESRD management [3].

The intricate nature of treatment plans, involving multiple dosages, formulations, and administration times, poses substantial difficulties in achieving sustained adherence for HD patients [4]. Research indicates an average medication non-adherence rate of 52.5% in this population [5]. Adherence continues to be problematic among individuals with ESRD [6]. One investigation revealed that merely 54.3% of ESRD patients complied with their prescribed therapies, attributing non-adherence to elements like younger age, memory lapses, economic difficulties, and regimen complexity [7, 8].

Additionally, patients' perceptions regarding their treatments serve as a key obstacle to compliance in dialysis settings [9]. Those who perceived no health benefits were more likely to disregard medications [10]. The relationship between healthcare providers and patients significantly influences compliance, as empathetic and encouraging interactions with clinicians can enhance it [11]. Failure to adhere to medications leads to detrimental effects, including higher rates of hospital admissions and death, while the annual costs associated with managing related complications average around $100 billion [10].

Motivational interviewing (MI) is an evidence-based counselling approach designed to facilitate behaviour modification by strengthening personal motivation and confidence [12]. Pharmacists, with their specialised knowledge in pharmacotherapy and counselling, are well-positioned to tackle adherence challenges in HD patients. Interventions led by pharmacists using MI have demonstrated benefits in boosting adherence across various chronic conditions. Nevertheless, limited evidence exists on the effectiveness of such pharmacist-led strategies specifically for haemodialysis populations. To the best of our knowledge, this intervention is not routinely implemented in Malaysia's healthcare framework.

Therefore, the present research seeks to address this evidence gap by investigating the effects of motivational interviewing as an innovative counselling technique for promoting sustained behavioural shifts and adherence to therapy in Malaysian HD patients.

Materials and Methods

Study design

A prospective pre-post intervention study was performed with HD patients from the Haemodialysis Unit at Hospital Kuala Lumpur (HKL) and affiliated dialysis centres of University Malaya Medical Centre (UMMC). Participants were monitored over 12 months.

Sample size

The required sample size was determined using Power and Sample Size Calculation software version 3.1. With a power of 0.95 and a 95% confidence interval, the calculated minimum was 56 patients.

$$n >= Z\,\alpha/2\,\frac{+Z\,\beta\,2}{ES} \quad (1)$$

n= sample size
Z= statistic for level of confidence, using a 95% confidence
interval (so Z=1.96)
$\alpha = 0.05$
β = type 11 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

This investigation involves a paired continuous outcome variable. Previous evidence suggests that the paired differences follow a normal distribution with a standard deviation of 1.84. To detect a true mean paired difference of 0.9, with 95% power to reject the null hypothesis of zero difference (at a two-sided Type I error rate of 0.05), approximately 56 pairs are required. To account for a potential 25% dropout rate or incomplete data, the sample was inflated accordingly, resulting in a target of around 70 participants.

Participants

The study included all patients with end-stage renal disease (ESRD) aged 18 years or older who had been receiving hemodialysis (HD) three times per week for at least three months and were proficient in English or Malay. Exclusion criteria encompassed patients with major surgical procedures in the preceding three months, active malignancies, cognitive impairment, dementia, active psychosis, significant hearing loss, or those who were pregnant or breastfeeding.

Patient selection

A comprehensive roster of active ESRD patients on regular HD was obtained from the heads of the dialysis units. Simple random sampling was performed using an online research randomizer tool. The full patient list was inputted to generate random assignments for recruitment. Selected patients provided written informed consent before enrollment. Demographic information, including age, gender, medical and medication history, dialysis details, and prescribed medications (name, dose, frequency, route, and duration), was extracted from electronic health records.

Interventions

The study employed a patient-centered pharmacist-delivered intervention based on a novel motivational interviewing (MI) approach. MI is a collaborative counseling method that encourages patients to reflect on and discuss their medication-taking behaviors [14]. This intervention aimed to equip patients with disease knowledge, address medication-related beliefs, identify and overcome adherence barriers, and deliver tailored instructions for optimal medication use [15]. It helps patients explore and resolve ambivalence about behavior change by drawing on their personal values and goals, employing specific techniques [16]. The four key domains applied here—disease education, belief addressing, barrier resolution, and personalized medication guidance—align with established MI principles and strategies [16].

Motivational interviewing training

MI requires skilled application under expert supervision. The pharmacist-researcher underwent dedicated MI training prior to the study, delivered by a certified professional counselor from the Centre for Counselling Services at Taylors University. The program included reading resources, video demonstrations of MI techniques, and interactive discussions. Upon completion, the researcher gained confidence and proficiency in patient engagement and MI delivery.

Data collection procedure

MI sessions occurred at months 3, 6, and 9, each lasting 15–20 minutes. The initial session was in-person during a scheduled dialysis visit to foster rapport. Subsequent sessions were conducted by telephone at convenient times for patients, allowing greater reflection on behavior change away from the fatiguing and noisy dialysis environment. This hybrid approach, with telephone follow-ups, has demonstrated effectiveness in prior studies [17] and prioritized safety for patients and the researcher. Three sessions were selected to reinforce motivation and enhance medication adherence.

Outcome measure

Medication adherence was assessed using the General Medication Adherence Scale (GMAS), a validated tool for chronic conditions [18]. Patients completed 11 items scored on a 4-point Likert scale ("Always" = 0, "Mostly" = 1, "Sometimes" = 2, "Never" = 3), yielding a maximum of 33 points. Cumulative scores categorized adherence as: high (30–33), good (27–29), partial (17–26), low (11–16), or poor (0–10). The GMAS evaluates three domains: patient-related non-adherence (questions 1–5), additional illnesses and pill burden (questions 6–9), and cost-related factors (questions 10–11) [18].

Intervention timeline

Adherence was measured at baseline (pre-intervention) and at the end of the study (post three MI sessions). Baseline and final scores were compared to identify significant improvements. **Table 1** summarizes the study activities.

Table 1. Overview of Study Activities by Time Point

Study Activity	Baseline (Month 0)	Month 3	Month 6	Month 9	Month 12
Enrollment of participants	✓				
Collection of demographic and baseline data	✓				
Motivational interviewing session	✓	✓	✓		
Adherence evaluation using GMAS tool		✓	✓	✓	✓

Statistical analysis

Continuous variables, being normally distributed, were reported as mean ± standard deviation, whereas categorical variables were presented as percentages. Associations between baseline medication adherence scores and the GMAS domains (patient-related nonadherence, nonadherence due to comorbidities and pill burden, and nonadherence due to financial constraints) were explored. All analyses were conducted using SPSS version 26.0 (IBM Corp., Armonk, NY, USA), with statistical significance defined as $p < 0.05$. Independent t-tests were used for comparisons between two groups, and one-way ANOVA for comparisons involving more than two groups across the numerical domains. Changes in adherence patterns before and after the intervention were evaluated using paired-sample t-tests.

Results and Discussion

Demographic characteristics of recruited hemodialysis (HD) patients

Initially, 71 patients were enrolled, but the study was completed by 63 patients. Data from eight patients were excluded due to transfer to other centers (n = 2) and mortality (n = 6). The mean age of participants was 48.5 ± 13.9 years. The majority were female (n = 36, 57.1%) and married (n = 51, 81%). Although 57 patients (90.5%) were prescribed more than five medications, the mean number of medications was 8.1 ± 2.2. The average duration on dialysis was 7.7 ± 6.0 years. Most patients (n = 41, 65.1%) had fewer than three comorbidities, while about one-third had three or more. The most common comorbidities were hypertension (n = 39, 36.5%), diabetes mellitus (n = 20, 18.7%), and hyperlipidemia (n = 12, 11.2%) **(Table 2)**.

As shown in **Table 3**, at baseline, 11 patients (17.5%) exhibited high adherence, 27 (42.9%) had good adherence, and 25 (39.7%) demonstrated partial adherence according to GMAS scores. No patients were classified as having low or poor adherence.

Factors Associated with Baseline Medication Adherence Scores in HD Patients Across GMAS Domains

In the patient-related nonadherence domain, the number of medications prescribed was statistically significant. Patients taking fewer than five medications had significantly higher adherence scores (13.0 ± 1.5) than those taking more than five (11.3 ± 1.6; $p = 0.016$).

In the domain of nonadherence due to financial constraints, marital status was significantly associated with adherence. Married patients showed higher scores (5.5 ± 0.7) compared to unmarried patients (4.5 ± 1.7; $p = 0.007$).

No demographic or clinical factors were found to be significantly associated with scores in the domain of nonadherence due to comorbidities and pill burden.

Table 4 presents comparisons of demographic and clinical characteristics with GMAS subscale scores at baseline.

Table 2. Socio-demographic and clinical characteristics of the study participants (n=63)

Characteristic	n (%)	Mean (±SD)
Age		48.5 ± 13.9
< 65 years	54 (85.7)	
≥ 65 years	9 (14.3)	
Gender		
Male	27 (42.9)	
Female	36 (57.1)	
Marital status		
Single	12 (19.0)	
Married	51 (81.0)	
Number of medications		8.1 ± 2.2
< 5	6 (9.5)	
≥ 5	57 (90.5)	
Duration of dialysis (years)		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)	
Number of comorbidities		2.2 ± 1.3
< 3	41 (65.1)	
≥ 3	22 (34.9)	

Table 3. Distribution of medication adherence levels based on GMAS scores among hemodialysis patients at baseline (n=63)

Adherence Classification (GMAS Score)	n (%)
High adherence (30–33)	11 (17.5)
Good adherence (27–29)	27 (42.9)
Partial adherence (17–26)	25 (39.7)
Low adherence (11–16)	0 (0.0)
Poor adherence (0–10)	0 (0.0)

Medication adherence scores among recruited hemodialysis patients at study completion

As shown in **Table 5**, at the end of the study, more than half of the participants—36 (57.1%)—demonstrated high medication adherence. The mean adherence score improved slightly from 5.3 ± 1.1 at baseline to 5.4 ± 1.0 post-intervention; however, this change was not statistically significant ($p > 0.05$). These results indicate that the intervention likely exerted a positive effect on medication adherence in hemodialysis patients, especially in reducing nonadherence related to patient behavior, comorbid conditions, and pill burden.

Table 4. Comparison of demographic and clinical characteristics of recruited patients with GMAS subscale scores at baseline

Characteristic	n (%)	Nonadherence from patient attitude	P-value	Nonadherence due to comorbidities and medication burden	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
Employed	16 (25.4)	11.1 ± 1.8		10.3 ± 1.6		5.6 ± 0.6	
Unemployed	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	
Alcohol consumption			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	
Number 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	

Dialysis duration (years)		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	
Number 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. Distribution of medication adherence levels among recruited HD patients at the end of the study

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

Following the MI intervention sessions, the number of patients classified under good and partial adherence decreased by 10 and 16, respectively, as they shifted into the high adherence category, while only one patient's adherence declined to the low level (1.6%).

Comparison of pre- and post-intervention medication adherence scores among recruited HD patients

In this study, medication adherence scores were categorized as pre-intervention (before MI sessions) and post-intervention (after MI sessions) by the researcher. As shown in **Table 6**, for the domain "Nonadherence due to patient attitude," the mean score before the intervention was 11.4 ± 1.6, which increased to 12.7 ± 1.8 after the intervention. The associated p-value was <0.05, indicating that this improvement was statistically significant, with a 95% confidence interval for the mean increase ranging from –1.75 to –0.75. Similarly, for "Nonadherence due to additional illness and pill burden," the mean score increased from 9.9 ± 1.4 pre-intervention to 11.0 ± 1.5 post-intervention, also reaching statistical significance ($p < 0.05$), with a 95% confidence interval for the mean improvement between –1.52 and –0.61. In contrast, nonadherence due to financial constraints did not show a significant change.

The mean age of participants in this study was 48.5 years, which aligns with findings reported by Dian *et al*. (2020), where 70.6% of HD patients were under 60 years of age, suggesting that younger patients are increasingly affected by chronic kidney disease [19]. According to the 24th Report of The Malaysian Dialysis & Transplant Registry (2016), over 80% of newly registered patients were aged 45 years or older.

A predominance of female patients was observed in this study, slightly differing from other reports where males represented the majority [20]; however, globally, the proportion of women receiving HD is rising [21]. Factors such as women's reluctance to seek medical care may contribute to this trend [22]. HD patients often consume numerous medications due to multiple comorbidities and complications related to their disease, complicating their care [23]. Consequently, they are more susceptible to medication-related problems (MRPs), which can contribute to nonadherence [24].

Given that poor adherence remains the most significant and challenging barrier among HD patients, the MI approach employed in this study, coupled with positive reinforcement, allowed identification of the underlying causes of nonadherence. Notably, this study assessed adherence using the GMAS scale, which adds novelty, as previous systematic reviews have primarily employed tools such as the Medication Adherence Report Scale (MARS), the Brief Medication Questionnaire (BMQ), and the Morisky 8-item Medication Adherence Scale (MMAS-8) [5, 25].

Table 6. Comparison of medication adherence scores before and after intervention among recruited HD patients

Domain	Post-intervention Mean (SD)	Pre-intervention Mean (SD)	P-value
Nonadherence related to patient attitude	12.7 ± 1.8	11.4 ± 1.6	<0.05
Nonadherence due to comorbidities and pill burden	11.0 ± 1.5	9.9 ± 1.4	<0.05
Nonadherence linked to financial constraints	5.4 ± 1.0	5.3 ± 1.1	0.507

In this study, prior to the pharmacist's intervention, only 17.5% of the enrolled hemodialysis (HD) patients demonstrated high medication adherence. Low treatment adherence is a common issue with substantial clinical implications in dialysis patients [26]. Statistical analysis identifying factors influencing baseline adherence revealed a significant association between non-compliance related to patient attitude and the number of medications prescribed. Patients taking fewer than five medications had higher mean adherence scores compared to those taking more than five, likely due to the increased complexity of regimens with higher pill counts, varied dosing schedules, and frequencies, which can reduce medication-taking behavior in HD patients [27].

Additionally, regarding non-compliance due to financial constraints, married HD patients exhibited significantly higher adherence scores than unmarried patients. A similar pattern was observed in a study by Sheikh *et al*. involving 191 HD patients, where married individuals showed greater medication adherence than single, divorced, widowed, or those who had lost a partner [28]. Evidence also indicates that support from close family members can enhance patient adherence [29].

Following the pharmacist's implementation of motivational interviewing (MI), post-intervention results indicated that over half (57.1%) of the participants achieved high medication adherence by the study's conclusion. A systematic review of 17 studies demonstrated improved medication adherence in groups receiving pharmacist-delivered MI [15]. More recently, another systematic review evaluating MI's effectiveness for medication adherence in adults with chronic diseases found that 23 out of 54 studies reported significant improvements following pharmacist-led MI [30]. Notably, both reviews focused on conditions such as cardiovascular disease, psychiatry, HIV, and endocrinology, with no inclusion of HD patients. Thus, the current study provides evidence that pharmacist-conducted MI can effectively improve medication adherence in HD patients.

Overall, paired t-test results indicated significant reductions in non-compliance related to patient attitude, as well as domains involving additional illnesses and pill overload, after the pharmacist-led MI sessions. Erroneous beliefs about medications were identified as a key factor in intentional non-adherence among HD patients, as individuals may develop personal perceptions that lead to deliberate skipping of doses [31]. These findings highlight that pharmacists' application of MI techniques effectively boosts patients' intrinsic motivation, fostering positive beliefs and behaviors toward medications, ultimately enhancing treatment adherence.

Limitations

The study was limited by its small sample size and conduction in only a few dialysis units in Malaysia, restricting the generalizability of results. Adherence was assessed via self-reported questionnaires, which are susceptible to recall bias and social desirability bias. Furthermore, the absence of a standardized communication protocol between pharmacists and physicians in the dialysis units resulted in some recommendations being disregarded.

Strengths

Despite challenges posed by the pandemic, the study demonstrated improvements in mean quality-of-life and adherence scores following the pharmacist-led interventions using medication review (MR) and MI. Although some outcomes lacked statistical significance, the process of comprehensive, patient-centered interviews incorporating MR and MI principles had a meaningful clinical impact on optimizing medication regimens, thereby improving adherence, quality of life, and potentially clinical outcomes. Future research should explore cost-benefit analyses to substantiate the value of integrating pharmacist-led MI into healthcare teams.

Conclusion

This study demonstrates that pharmacist interventions employing MI—a patient-centered approach—successfully modify behavior, enhance beliefs, and strengthen intrinsic motivation for medication adherence. It underscores pharmacists' role in pharmaceutical care and emphasizes the value of including clinical pharmacists in interdisciplinary dialysis teams. Accordingly, the findings recommend that dialysis unit directors, clinicians, and hospital administrators prioritize the integration of pharmacist-based pharmaceutical care services for HD patients.

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